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EDEXCEL GCSE SCIENCES 2011

Edexcel GCSE in Biology - 2BI01

Accredited specification booklet

This booklet provides:

- an introduction to the specification
- annotated specification pages
- the accredited specification

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Welcome

We are delighted to introduce you to our new GCSE in Biology for 2011. At the front of this publication, we have supplied a handy guide containing annotated pages from the accredited specification that provide you with explanations and insights into its content and structure.

This introduction is then followed by the accredited specification. We've listened to science teachers and the wider science community, ensuring the development of a new suite of GCSE science qualifications that:

- puts good science at the heart of teaching, learning and assessment
- is presented in clear and detailed specifications
- has examination papers designed and trialled to be accessible to all, with appropriate stretch for your able students
- provides clear and manageable controlled assessments
- has an achievable approach to practical work.

Accompanying this specification are our accredited sample assessment and sample controlled assessment materials, plus a selection of valuable support materials that make up our Enhanced Specifications Pack. Together, these items have been created to provide you with the information you need to prepare, teach and assess our exciting new qualification.

Our team of experts are on hand to discuss any questions you may have about the information contained in this pack. You can contact our Science Subject Advisor team, led by Stephen Nugus by calling **0844 372 2188**, or emailing **ScienceSubjectAdvisor@edexcelexperts.co.uk**

Supporting science, supporting you

The following section contains annotated pages from our accredited GCSE in Biology specification to help you see quickly and easily how we've developed our qualifications to give you clear and detailed support.

Unit B1: Influences on life

Overview

Content and How Science Works overview

In Unit B1 students study three topics that enable them to find out more about how they fit into the world and how organisms are affected by and respond to internal and external influences.

Practical investigations throughout the unit will give students opportunities to plan and carry out investigations. They will devise their own models and evaluate them. They will also assess and manage risks, trial their plans and consider how the quality of their data might be improved. They will analyse data, draw conclusions providing evidence to support their conclusions, and evaluate to what degree the conclusion supports the hypothesis.

Throughout the unit, students will have the opportunity to improve and demonstrate mathematical skills. This includes learning about direct proportion and simple ratios, calculating arithmetic means, plotting and drawing graphs (line graphs, bar charts, pie charts, scatter graphs, histograms), selecting appropriate scales for the axes, translating information between graphical and numeric form, extracting and interpreting information from charts, graphs and tables, and understanding the idea of probability.

Topic 1 explores the general characteristics of animals and plants, and then looks more closely at the five vertebrate groups and organisms that can survive in extreme environments. In this topic students will learn about the problems of classifying some organisms and will study variation, as well as the basic principles of inheritance and Darwin's theory of evolution by natural selection.

Work on classification systems shows students how data collected over time can have different interpretations and how ideas and theories change as more data is collected. The evidence we now have to support Darwin's theory of natural selection illustrates the importance of collecting data to develop and test theories.

Work on food chains, the process of natural selection and patterns of inheritance provides opportunities to use models and theories to explain observed data.

Students will critically evaluate evidence, suggesting reasons for inconsistencies in the data collected and ways to improve precision or reproducibility of results. Students will have the opportunity to work quantitatively when collecting data and in studying percentage probabilities and biomass and energy in food chains.

In Topic 2 students will investigate how humans detect and respond to changes in their external and internal environments, including the role of hormones and the nervous system. Students will also explore the role of hormones in plants in terms of responding to stimuli.

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The Examiner explains

This gives a basic overview of the unit. A more detailed overview can be found in the teacher support materials provided.

The Examiner explains

These mathematical skills are new for GCSE 2011 and have been specified by Ofqual in order to ensure that GCSE scientists are mathematically literate.

Examiner's teaching tip

You can organise the way in which you divide up your topics. We will provide schemes of work which suggest the number of hours to be spent on each topic. However, the decision on how many hours to allocate is left to the discretion of the individual teacher.

Work on how organisms respond to change provides opportunities to see how phenomena can be explained by developing and using scientific theories, models and ideas.

Students will present information, develop arguments and draw conclusions using scientific, technical and mathematical language, conventions and symbols and ICT tools when investigating how organisms respond to change and how blood glucose levels are regulated.

Students will consider the use of contemporary science and technological developments and their benefits, drawbacks and risks when exploring the links between obesity and Type 2 diabetes, and in the commercial use of plant hormones.

Topic 3 begins by looking at the ways in which the functioning of the body is affected by external factors such as drugs and pathogens. Students will also discover how scientists have contributed to the development and use of antibiotics and antiseptics. They will go on to learn about the interdependence of organisms on Earth and natural nutrient cycles, before finding out how chemicals produced by human activities can pollute the planet on which they live.

Work on the carbon and nitrogen cycles provides opportunities to use models and theories to explain observed data.

Students will consider how decisions about, for example, smoking, drug or alcohol policies, are informed by scientific evidence of the effect on the human body. However, these decisions cannot be made using science alone as there are implications for society. We must also consider ethical issues when deciding whether to use technology; for example, when deciding whether a patient is suitable for an organ transplant.

Throughout the unit students will learn about the importance of the application of biology to improving health and food production, such as the development of new drugs and antibiotics, and the commercial uses of plant hormones. They will evaluate the advantages, disadvantages and risks of the use or misuse of drugs, and consider how decisions such as whether or not to recycle waste are taken.

Assessment overview

This unit is externally assessed, through a one hour, 60 mark, tiered written examination, containing six questions.

The examination will contain a mixture of question styles, including objective questions, short answer questions and extended writing questions.

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The Examiner explains

A more detailed assessment overview can be found within the *Assessment guide* provided.

Practical investigations in this unit

Within this unit, students will develop an understanding of the process of scientific investigations, including that investigations:

- use hypotheses which are tested
- require assessment and management of risks
- require the collection, presentation, analysis and interpretation of primary and secondary evidence including the use of appropriate technology
- should include a review of methodology to assess fitness for purpose
- should include a review of hypotheses in the light of outcomes.

The following specification points are practical investigations that exemplify the scientific process and may appear in the written examination for this unit:

1.14 *Investigate the variations within a species to illustrate continuous variation and discontinuous variation*

2.16 *Investigate tropic responses*

2.22 *Investigate human responses to external stimuli*

3.3 *Investigate reaction times*

3.15 *Investigate the effects of antiseptics or antibiotics on microbial cultures*

3.23 *Investigate the effect of pollutants on plant germination and plant growth*

The following are further suggestions for practical work within this unit:

- *Investigate inheritance using suitable organisms or models*
- *Investigate the speed of transmission of electrical impulses in the nervous system*
- *Investigate the presence of sugar in simulated urine/body fluids*
- *Investigate the effect of light and/or gravity on plant growth*
- *Investigate antimicrobial properties of plants*
- *Investigate how indicator species can be used to assess levels of pollution in water or the atmosphere*

The controlled assessment task (CAT) for the GCSE in Biology will be taken from any of these practical investigations (specification points and further suggested practical work). This task will change every year, so future CATs will be chosen from this list.

Examiner's teaching tip

As well as the practicals that are embedded in the specification, here is an extended list of practical activities which you may wish to carry out with your students if there is time.

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Detailed unit content

In this specification bold text refers to higher tier only content. Italic text refers to practical investigations, which students are required to demonstrate an understanding of.

Topic 1

Classification, variation and inheritance

1.1 Demonstrate an understanding of how biologists classify organisms according to how closely they are related to one another including:

- a Species – groups of organisms that have many features in common
- b Genus – contains several species with similar characteristics
- c Family – comprising of several genera
- d Order – comprising of several families
- e Class – comprising of several orders
- f Phylum – comprising of several classes
- g The Five Kingdoms – animalia, plantae, fungi, protoctista and prokaryotes

1.2 Describe the main characteristics of the five kingdoms including:

- a Animalia – multicellular, do not have cell walls, do not have chlorophyll, feed heterotrophically
- b Plantae – multicellular, have cell walls, have chlorophyll, feed autotroprically
- c Fungi – multicellular, have cell walls, do not have chlorophyll, feed saprophytically
- d Protoctista – unicellular, have a nucleus
- e Prokaryotes – unicellular, have no nucleus

1.3 Explain why scientists do not classify viruses in any of the five kingdoms and regard them as non-living

1.4 Describe the main characteristics of the phylum Chordata as animals with a supporting rod running the length of the body, an example of this being the backbone in vertebrates

1.5 Explain how scientists place vertebrates into groups based on:

- a Oxygen absorption methods – lungs, gills and skin
- b Reproduction – internal or external fertilisation, oviparous or viviparous
- c Thermoregulation – homeotherms and poikilotherms

1.6 Demonstrate an understanding of the problems associated with assigning vertebrates to a specific group based on their anatomy and reproduction methods and why many vertebrates are difficult to classify

The Examiner explains

We've designed the specification so that the level of detail needed to teach is apparent.

1.7 Discuss why the definition of a species as organisms that produce fertile offspring may have limitations: some organisms do not always reproduce sexually and some hybrids are fertile

1.8 **Explain why binomial classification is needed to identify, study and conserve species, and can be used to target conservation efforts**

1.9 Explain how accurate classification may be complicated by:

- a variation within a species
- b **hybridisation in ducks**
- c **ring species**

1.10 Construct and use keys to show how species can be identified

1.11 Explain how organisms are adapted to their environment and how some organisms have characteristics that enable them to survive in extreme environments, including deep-sea hydrothermal vents and polar regions

1.12 Demonstrate an understanding of Darwin's theory of evolution by natural selection including:

- a variation – most populations of organisms contain individuals which vary slightly from one to another
- b over-production – most organisms produce more young than will survive to adulthood
- c struggle for existence – because populations do not generally increase rapidly in size there must therefore be considerable competition for survival between the organisms
- d survival- those with advantageous characteristics are more likely to survive this struggle
- e advantageous characteristics inherited – better adapted organisms are more likely to reproduce successfully passing on the advantageous characteristics to their offspring
- f gradual change – over a period of time the proportion of individuals with the advantageous characteristics in the population will increase compared with the proportion of individuals with poorly adapted characteristics, and the poorly adapted characteristics may eventually be lost

1.13 Describe variation as continuous or discontinuous

1.14 *Investigate the variations within a species to illustrate continuous variation and discontinuous variation*

1.15 Interpret information on variation using normal distribution curves

1.16 Demonstrate an understanding of the causes of variation, including:

- a genetic variation – different characteristics as a result of mutation or reproduction
- b environmental variation – different characteristics caused by an organism's environment (acquired characteristics)

1.17 **Demonstrate an understanding of how speciation occurs as a result of geographic isolation**

1.18 Explain how new evidence from DNA research and the emergence of resistant organisms supports Darwin's theory

1.19 Explain the role of the scientific community in validating new evidence, including the use of:

- a scientific journals
- b the peer review process
- c scientific conferences

1.20 Describe the structure of the nucleus of the cell as containing chromosomes, on which genes are located

1.21 Demonstrate an understanding that genes exist in alternative forms called alleles which give rise to differences in inherited characteristics

1.22 Recall the meaning of, and use appropriately, the terms: dominant, recessive, homozygous, heterozygous, phenotype and genotype

1.23 Analyse and interpret patterns of monohybrid inheritance using a genetic diagram, Punnett squares and family pedigrees

1.24 Calculate and analyse outcomes (using probabilities, ratios and percentages) from monohybrid crosses

1.25 Describe the symptoms of the genetic disorders:

- a sickle cell disease
- b cystic fibrosis

1.26 **Evaluate the outcomes of pedigree analysis when screening for genetic disorders:**

- a **sickle cell disease**
- b **cystic fibrosis**

Topic 2

Responses to a changing environment

2.1 Define homeostasis as the maintenance of a stable internal environment

2.2 Demonstrate an understanding of the homeostatic mechanisms of:

- a thermoregulation and the effect of temperature on enzymes
- b osmoregulation
- c blood glucose regulation

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Examiner's teaching tip

All students should have an understanding of sickle cell disease and cystic fibrosis. For Foundation Tier, this is limited to the symptoms of these disorders, but Higher Tier candidates will be expected to understand how they are inherited.

2.3 Explain how thermoregulation takes place, with reference to the function of the skin, including:

- a the role of the dermis – sweat glands, blood vessels and nerve endings, hair, erector muscles and sebaceous glands
- b the role of the hypothalamus – regulating body temperature

2.4 **Explain how thermoregulation takes place, with reference to:**

- a **vasoconstriction**
- b **vasodilation**
- c **negative feedback**

2.5 Recall that hormones are produced in endocrine glands and are transported by the blood to their target organs

2.6 Explain how blood glucose levels are regulated by insulin and excess blood glucose is converted to glycogen in the liver

2.7 **Explain how blood glucose levels are regulated by causing the conversion of glycogen to glucose**

2.8 Recall that Type 1 diabetes is caused by a lack of insulin

2.9 Explain how Type 1 diabetes can be controlled, including the roles of diet and injection of insulin usually into the subcutaneous fat

2.10 Explain how, in Type 1 diabetes, the level of physical activity and diet affect the amount of insulin required

2.11 Recall that Type 2 diabetes is caused by a person becoming resistant to insulin

2.12 Explain how Type 2 diabetes can be controlled by diet and physical activity

2.13 Evaluate the correlation between obesity (including calculations of BMI) and Type 2 diabetes

2.14 Explain how plant growth substances (hormones) bring about:

- a positive phototropism in shoots
- b positive gravitropism (geotropism) in roots

2.15 Explain how auxins bring about shoot curvature using cell elongation

2.16 *Investigate tropic responses*

2.17 Analyse, interpret and evaluate data from plant hormone experiments, including the action of auxins and gibberellins

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2.18 **Demonstrate an understanding of the uses of plant hormones, including:**
- a **selective weedkillers**
- b **rooting powder**
- c **seedless fruit**
- d **fruit ripening**

2.19 Recall that the central nervous system consists of the brain and spinal cord and is linked to sense organs by nerves

2.20 Explain the structure and function of dendrons and axons in the nervous system

2.21 Describe how stimulation of receptors in the sense organs sends electrical impulses along neurones

2.22 *Investigate human responses to external stimuli*

2.23 Describe the structure and function of sensory, relay and motor neurones and synapses including:
- a the role of the myelin sheath
- b the role of neurotransmitters
- c the reflex arc

Topic 3

Problems of, and solutions to a changing environment

3.1 Define a drug as a chemical substance, such as a narcotic or hallucinogen, that affects the central nervous system, causing changes in psychological behaviour and possible addiction

3.2 Describe the general effects of:
- a painkillers that block nerve impulses, including morphine
- b hallucinogens that distort sense perception, including LSD
- c stimulants that increase the speed of reactions and neurotransmission at the synapse, including caffeine
- d depressants that slow down the activity of the brain, including alcohol

3.3 *Investigate reaction times*

3.4 Explain the effects of some chemicals in cigarette smoke, including:
- a nicotine as an addictive drug
- b tar as a carcinogen
- c carbon monoxide reducing the oxygen-carrying ability of the blood

3.5 Evaluate data relating to the correlation between smoking and its negative effects on health

Foundation and Higher

Higher Tier content is highlighted in bold

3.6 Evaluate evidence of some harmful effects of alcohol abuse:
- a in the short term – blurred vision, lowering of inhibitions, slowing of reactions
- b in the long term – liver cirrhosis, brain damage

3.7 Discuss the ethics of organ transplants, including:
- a liver transplants for alcoholics
- b heart transplants for the clinically obese
- c the supply of organs

3.8 Recall that infectious diseases are caused by pathogens

3.9 Describe how pathogens are spread, including:
- a in water, including cholera bacterium
- b by food, including *Salmonella* bacterium
- c airborne (eg sneezing), including influenza virus
- d by contact, including athlete's foot fungus
- e by body fluids, including HIV
- f by animal vectors, including:
  - i housefly: dysentery bacterium
  - ii *Anopheles* mosquito: malarial protozoan

3.10 Explain how the human body can be effective against attack from pathogens, including:
- a physical barriers – skin, cilia, mucus
- b chemical defence – hydrochloric acid in the stomach, lysozymes in tears

3.11 Demonstrate an understanding that plants produce chemicals that have antibacterial effects in order to defend themselves, some of which are used by humans

3.12 Describe how antiseptics can be used to prevent the spread of infection

3.13 Explain the use of antibiotics to control infection, including:
- a antibacterials to treat bacterial infections
- b antifungals to treat fungal infections

3.14 **Evaluate evidence that resistant strains of bacteria, including MRSA, can arise from the misuse of antibiotics**

3.15 *Investigate the effects of antiseptics or antibiotics on microbial cultures*

3.16 Recall that interdependence is the dynamic relationship between all living things

3.17 Demonstrate an understanding of how some energy is transferred to less useful forms at each trophic level and this limits the length of a food chain

3.18 Demonstrate an understanding that the shape of a pyramid of biomass is determined by energy transferred at each trophic level

3.19 Explain how the survival of some organisms may depend on the presence of another species:

- a parasitism, including:
  - i fleas
  - ii head lice
  - iii tapeworms
  - iv mistletoe
- b mutualism, including:
  - i oxpeckers that clean other species
  - ii cleaner fish
  - iii **nitrogen-fixing bacteria in legumes**
  - iv **chemosynthetic bacteria in tube worms in deep-sea vents**

3.20 Analyse, interpret and evaluate data on global population change

3.21 Explain how the increase in human population contributes to an increase in the production of pollutants, including phosphates, nitrates and sulfur dioxide

3.22 Explain how eutrophication occurs and the problems associated with eutrophication in an aquatic environment

3.23 *Investigate the effect of pollutants on plant germination and plant growth*

3.24 Demonstrate an understanding of how scientists can use the presence or absence of indicator species as evidence to assess the level of pollution:

- a polluted water indicator – bloodworm, sludgeworm
- b clean water indicator – stonefly, freshwater shrimps
- c air quality indicator – lichen species, blackspot fungus on roses

3.25 Demonstrate an understanding of how recycling can reduce the demand for resources and the problem of waste disposal, including paper, plastics and metals

3.26 Demonstrate an understanding of how carbon is recycled:

- a during photosynthesis plants remove carbon dioxide from the atmosphere
- b carbon compounds pass along a food chain
- c during respiration organisms release carbon dioxide into the atmosphere
- d decomposers release carbon dioxide into the atmosphere
- e combustion of fossil fuels releases carbon dioxide into the atmosphere

Examiner's teaching tip

There are plenty of opportunities to go further into *How Science Works*, should time allow.

3.27 **Demonstrate an understanding of how nitrogen is recycled:**

- a **nitrogen gas in the air cannot be used directly by plants and animals**
- b **nitrogen-fixing bacteria living in root nodules or the soil can fix nitrogen gas**
- c **the action of lightning can convert nitrogen gas into nitrates**
- d **decomposers break down dead animals and plants**
- e **soil bacteria convert proteins and urea into ammonia**
- f **nitrifying bacteria convert this ammonia to nitrates**
- g **plants absorb nitrates from the soil**
- h **nitrates are needed by plants to make proteins for growth**
- i **nitrogen compounds pass along a food chain or web**
- j **denitrifying bacteria convert nitrates to nitrogen gas**

Make the most of your Edexcel Enhanced Specifications Pack

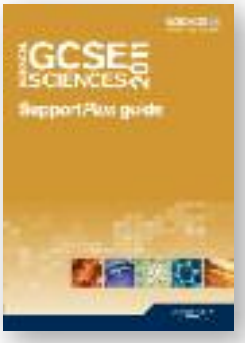
In addition to our five specifications, your Enhanced Specifications Pack includes our accredited sample assessment and sample controlled assessment materials. These too have been produced with annotated introductions to help you see how we've made our assessment clear to understand. We have also developed the following support materials, which provide valuable tools for your preparation, teaching and assessment of our exciting new specifications.

Getting started guide

An at-a-glance introduction to our specifications. This guide shows you how easy it is to move to Edexcel, detailing the support available to help you do so. It also offers guidance on teaching each unit, providing suggestions for managing assessment and support with preparing students for extended writing and mathematics.

Assessment guide

Developed to give you detailed support with managing assessment, the Assessment guide covers ways of scheduling and administering controlled assessment, including suggestions for making entries and choosing tiers. It provides information on Results*Plus*, our free results analysis service that provides unrivalled support with performance analysis, and includes a selection of exemplar answers to exam questions, with comments on how these should be assessed using our mark schemes.



SupportPlus guide

Providing detailed support with planning and implementation of our specifications, our Support*Plus* guide includes exemplar course plans, schemes of work and worksheets, all of which are ready-to-use, or available in editable format on our website.

GCSE & BTEC Links guide

This guide details the support we provide to make it easy for your students to move between GCSE and BTEC, and choose the learning pathway to which they are best suited.

Now turn to your copy of our accredited GCSE in Biology specification

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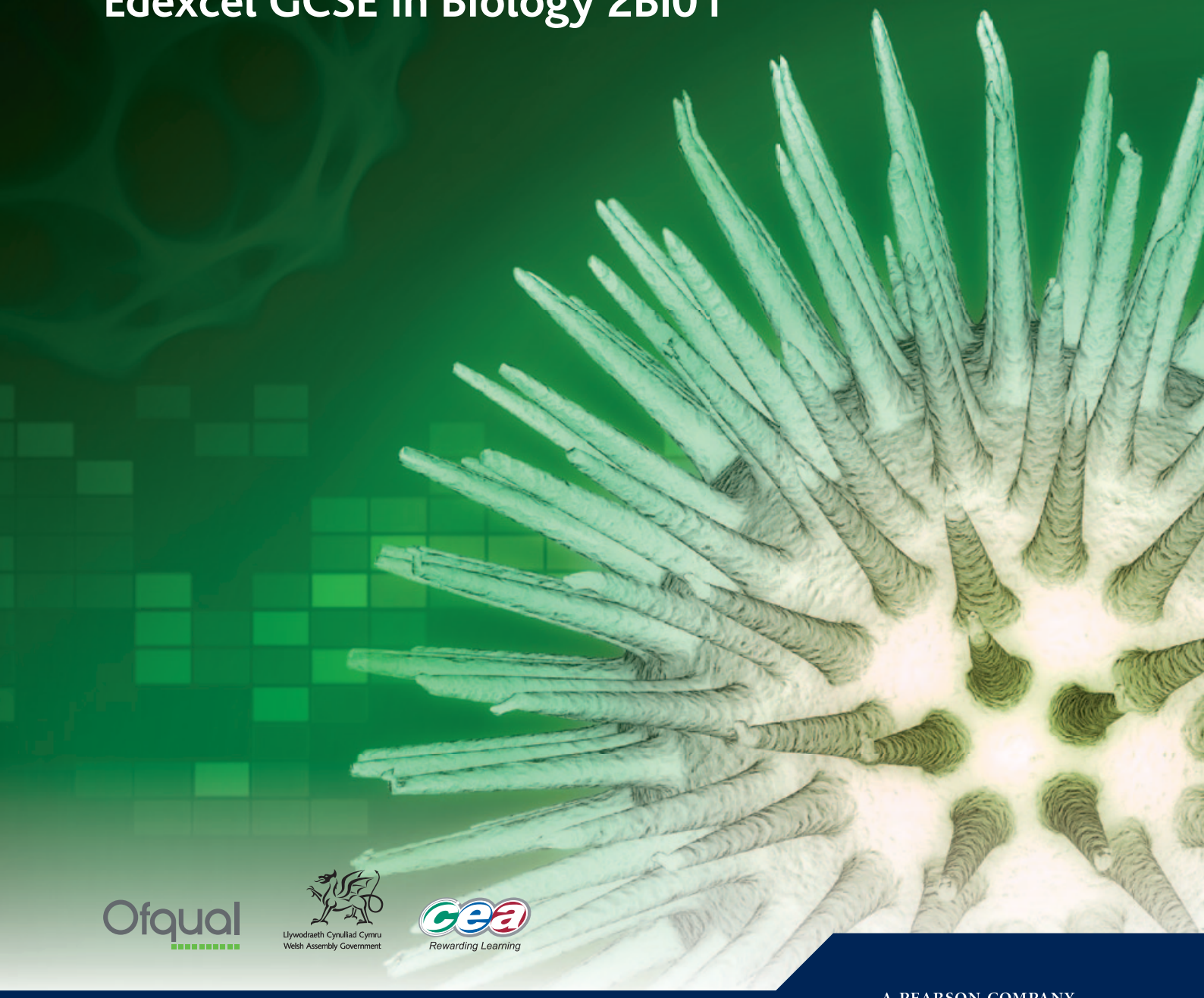
EDEXCEL GCSE SCIENCES 2011

Accredited specification

Edexcel GCSE in Biology 2BI01



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Specification

To help students fulfil their potential, we have developed a new suite of GCSE qualifications for Science that:

- puts good science at the heart of teaching, learning and assessment
- is presented in clear and detailed specifications
- has examination papers designed and trialled to be accessible with appropriate stretch
- has a clear and achievable approach to new requirements for controlled assessment and practical work
- is designed to allow you to choose the best learning pathway for each student
- supports you with help available online, on the phone and locally.

You will see that this specification is extremely detailed. This is to:

- ensure that you have a clear idea about what might be assessed in an examination
- make it easy for you to plan your teaching
- make sure you don't have to cover material twice in successive units because the progression of ideas is clear.

www.edexcel.com/science2011

Our website will be regularly updated with a vast range of materials to support you with the delivery of our qualifications, including:

- our accredited specifications, sample assessment materials and sample controlled assessment materials
- free planning and teaching resources
- access to our Subject Advisor Service
- information on our published resources
- access to ResultsPlus, our FREE online results analysis and mocks analysis service
- information on events taking place in your area.

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GCSE in Biology

Specification

Edexcel GCSE in Biology (2BI01)

First teaching September 2011

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Introduction

The Edexcel GCSE in Biology is designed for use in school and colleges. It is part of a suite of GCSE qualifications offered by Edexcel.

About this specification

Why choose Edexcel?

Every student can fulfil their potential

We are here to help you ensure that every student can fulfil their potential. At Key Stage 4 this is done by ensuring that they have the qualification they need to find work or progress to further learning.

To help students fulfil their potential, we have developed a new suite of GCSEs for Science that puts good science at the heart of teaching, learning and assessment, and:

- is based on an extremely clear and detailed specification
- has exam papers designed and trialled to be accessible and with appropriate stretch
- has a clear and achievable approach to new requirements for controlled assessment and practical investigations
- is designed to allow you to choose the best learning pathway for each student
- supports you with help available online, on the phone and locally.

An extremely clear and detailed specification

You will see that the specification is extremely detailed. This is to:

- ensure that you have a clear idea about what might be assessed in an exam
- make it easy for you to plan
- make sure you don't have to cover material twice in successive units because the progression of ideas is clear.

Exam papers designed and trialled to be accessible and with appropriate stretch

The new GCSEs for 2011 bring with them new regulatory requirements to test students using a variety of question types. The types we have included are:

- objective questions
- short answer questions
- longer answer questions, testing quality of written communication.

This represents an opportunity to ensure the exam papers remain accessible to students with a wide range of abilities while also giving them an opportunity to excel.

In response to this opportunity, using research undertaken by our Assessment Design team and in consultation with teachers, we have developed exam papers that are:

- accessible – early questions will generate confidence in students
- clear – the language is carefully checked and simple rules are followed for consistency

- able to stretch the students aiming for higher grades – longer answer questions are carefully written to ensure more able students know what they need to do to access all the marks and to ensure students aiming for lower grades can gain some marks
- consistent – to ensure that students are familiar with the paper style. This includes producing Sample Assessment Materials using the same quality control processes as live papers.

An achievable approach to new requirements for controlled assessment and practical investigations

We have designed the controlled assessment and theory content to ensure that the controlled assessment:

- is easy to plan
- is straightforward to mark
- follows a structure that helps test students' actual investigative skills
- is based on students' own practical work and collection of secondary evidence – as required by Ofqual subject criteria.

To help with planning and to develop skills, we have embedded a small number of practical investigations into the theory units. The benefits are twofold:

- Development of knowledge and skills can happen simultaneously, thus maximising teaching time.
- A mix of theory and practical learning is more likely to lead to secure acquisition of knowledge and skills.

Knowledge of these practical investigations and the ability to interpret the data that can result from them can be assessed in the examination papers. The best way to ensure this is to undertake the practical investigations.

Controlled assessment – Planning, Observations and Conclusions (POC)

To allow students to experience what a full investigation is like, within the limitations of a real school environment, the controlled assessments have been split into three parts – Planning, Observations and Conclusions. Marks from each can be submitted from separate tasks or from the same task. Whole task responses, from which marks have been submitted, should be retained for moderation.

For each controlled assessment we will produce specific marking support to help you apply the generic assessment criteria. All controlled assessments are marked to these generic assessment criteria regardless of subject. This means that you can apply generic assessment criteria to award marks where a student gives an answer that you see is correct, but falls outside the specific marking guidance for that controlled assessment.

Designed to allow you to choose the best learning pathway for each student

Depending on the learning approach that suits them, and the progression route that they wish to follow, different learning pathways can suit different students.

There's a great deal of shared content between BTEC Applied Science and our new GCSE Science suite, as both are based on the Key Stage 4 Programme of Study. We've used this overlap to your advantage by creating highly flexible KS4 Science learning pathways. The volume of shared content means you can take your time to choose the progression route that best meets your students' needs and most fits their learning approach.

We'll provide you with high-quality guidance and comprehensive teaching schemes, enabling you to identify the best pathway for your students. You can use the schemes to set work

that provides evidence that meets BTEC criteria and also forms a valuable part of your GCSE teaching. This will help you to:

see if a student works best with the BTEC approach or the GCSE approach

- delay the decision on moving students completely to BTEC or GCSE, or allow them the option of gaining both a GCSE and a BTEC qualification – depending on whether they become more interested in following a vocational or academic route
- have evidence gathered towards BTEC assignments for any students that move to a full BTEC course
- ensure you can cover GCSE teaching in the time available even if you are allowing students to try the BTEC approach early on in your Key Stage 4 teaching
- introduce some of the motivational aspects of the BTEC approach to all your students.

Supporting you with help available online, on the phone and locally

We recognise that the changing nature of teaching, with less time to travel to training, the need to continually review whether the expectations of students, parents and the community are being met, and a greater number of qualifications to offer means that you need more support available more quickly than ever before.

To help you we have committed to delivering expert support locally, online and at the end of the phone.

- We will be running free Launch, Getting Started and Getting Ready to Teach events.
- There will be online events at 4pm so you don't have to miss teaching.
- We will be working with your LA to provide you with the information and support you need. Look out for cluster groups and briefings in your area.
- If you have individual needs, you can call us to find out if an advisor can speak to you or visit you to discuss how to meet those needs.
- Our Science Subject Advisor team is on the end of the phone to help you with both subject-related and administrative queries.
- Our website is being radically updated. Visit www.edexcel.com/Science/ to find:
    - free teaching resources
    - a Y9 starter programme to help you with transition
    - free information on teaching GCSEs in Science with BTEC
    - a free mocks resource
    - our ResultsPlus Mock Analysis Service – get an early feel for how your students are coping with the new exam styles
    - our Subject Advisor webpage and Ask the Expert services – proven to help you.

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Specification at a glance

Units

The suite of GCSEs in Science qualifications are a nested set of qualifications:

GCSE in Science ➔	B1 25%	C1 25%	P1 25%	Science controlled assessment (SCA) 25%
GCSE in Additional Science ➔	B2 25%	C2 25%	P2 25%	Additional Science controlled assessment (ASCA) 25%
	B3 25%	C3 25%	P3 25%	
	Biology controlled assessment (BCA) 25%	Chemistry controlled assessment (CCA) 25%	Physics controlled assessment (PCA) 25%	
	GCSE in Biology ↑	**GCSE in Chemistry ↑**	**GCSE in Physics ↑**	

Details of each unit are given on the following pages.

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The Edexcel GCSE in Biology comprises four units:

- Units B1, B2, B3 and BCA

In this specification bold text refers to higher tier only content. Italic text refers to practical investigations, which students should have completed.

All externally assessed units will be assessed by tiered examinations. Students will need to be entered for a specific tier at the time of entry.

Unit B1: Influences on life	***Unit code: 5BI1F/5BI1H**
• Externally assessed • Availability: November, March and June • First assessment: November 2011	**25% of the total GCSE**
Overview of content This unit is split into three compulsory topics: • Classification, variation and inheritance • Responses to a changing environment • Problems of, and solutions to a changing environment	
Overview of assessment • This unit is assessed through a one hour, 60 mark, tiered written examination, containing six questions. • The examination will contain a mixture of question styles, including objective questions, short answer questions and extended writing questions.	

Unit B2: The components of life	*Unit code: 5BI2F/5BI2H
• Externally assessed • Availability: November, March and June • First assessment: June 2012	**25% of the total GCSE**
Overview of content This unit is split into three compulsory topics: • The building blocks of cells • Organisms and energy • Common systems	
Overview of assessment • This unit is assessed through a one hour, 60 mark, tiered written examination, containing six questions. • The examination will contain a mixture of question styles, including objective questions, short answer questions and extended writing questions.	

Unit B3: Using biology	*Unit code: 5BI3F/5BI3H
• Externally assessed • Availability: November, March and June • First assessment: June 2013	**25% of the total GCSE**
Overview of content This unit is split into three compulsory topics: • Control systems • Behaviour • Biotechnology	
Overview of assessment • This unit is assessed through a one hour, 60 mark, tiered written examination, containing six questions. • The examination will contain a mixture of question styles, including objective questions, short answer questions and extended writing questions.	

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Unit BCA: Biology controlled assessment	*Unit code: 5BH04
• Internally assessed • Available for moderation: November and June • First assessment: June 2013	**25% of the total GCSE**
Overview of content • For this unit students will complete one or more controlled assessment tasks related to Unit B2 or B3 content. • Each task consists of **three** parts. Part A is a planning activity, Part B is an observation, collecting primary and secondary evidence. Part C consists of conclusions related to the primary and secondary evidence collected in Part B.	
Overview of assessment • This unit is internally assessed under controlled conditions. • There will be two tasks available each year – one task from B2 and one task from B3. • Each task has a shelf life of one year. • The tasks will be available to teachers one year in advance. • Each task has three parts – Part A: Planning, Part B: Observations and Part C: Conclusions. • The total number of marks available for the three parts is 50. • Students must attempt all three parts of a task. • If they attempt both tasks, then the best marks from Part A, B and C should be submitted for the unit.	

*See *Appendix 1* for a description of this code and all other codes relevant to this qualification.

External assessments (examination papers)

Our overriding priority with exam papers is to ensure that:

- every student can show what they know, understand and are able to do
- every teacher knows what they must teach.

To do this we have produced a very detailed specification so that you and your students understand exactly what a student needs to know, understand and are able to do. To help you use this detailed specification, we have split it into topics.

Secondly, we have carried out extensive work, using science experts in our Assessment Design team and working closely with our senior examiners, to develop an exam paper style that can be consistently delivered and will be familiar to students. It includes three types of question part:

1. objective questions – used only where this will provide credible evidence of knowledge and skills
2. structured short answers – for maths, How Science Works or theory
3. longer answers worth six marks – to help provide stretch and challenge.

Papers are designed to allow students likely to get lower grades to achieve, while ensuring that some questions provide the stretch required to differentiate between students. Even the six mark question parts are designed with this aim.

Every question is designed to have an accessible starting point and then become more challenging. In addition, the paper itself is slightly ramped in difficulty. This maximises the opportunity for students to demonstrate their knowledge, understanding and skills in the exam.

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Controlled assessment tasks (internal assessments)

Practical investigations in the theory units – the simplest way to plan controlled assessment

The criteria for GCSEs in Science indicate that an investigative approach to internal assessment is required. The best way to develop investigative skills is to embed practicals in your teaching of theory. The benefits are twofold:

- development of knowledge and skills can happen together, thus saving time that can then be used by you in other aspects of your teaching
- a mix of theory and practical learning is more likely to lead to secure acquisition of knowledge and skills.

We have extended the benefit of this approach, if you choose to use it, by defining a small number of practicals in the theory units of the specification. Knowledge of these practicals, and the ability to interpret the data that can result, is required for exams.

Planning, Observations and Conclusions (POCs)

To allow students to experience what a full investigation is like, within the limitations of a real school environment, the controlled assessment task has been split into three parts, Part A – Planning, Part B – Observations and Part C – Conclusions. Students are required to attempt all three parts of the task. However, students can do two tasks. The best part marks from across both tasks can be submitted for the unit.

There is a set of assessment criteria within this specification. This assessment criteria is generic across the controlled assessment tasks for the GCSEs in Additional Science, Biology, Chemistry and Physics. Edexcel will give additional guidance on the application of the generic assessment criteria in support documentation.

A Qualification content

Key subject aims

GCSE in Biology

This GCSE in Biology encourages students to be inspired, motivated and challenged by following a broad, coherent, practical, satisfying and worthwhile course of study. It encourages students to develop their curiosity about the living world and provides insight into and experience of how science works. It enables students to engage with biology in their everyday lives and to make informed choices about further study in biology and related disciplines, and career choices.

Knowledge and understanding

This Edexcel GCSE in Biology qualification requires students to demonstrate knowledge and understanding of:

- biology as an evidence-based discipline
- the collaborative nature of science as a subject discipline and the way new scientific knowledge is validated
- how scientific understanding and theories develop and the limitations of science
- how and why decisions about science and technology are made
- ethical implications of biology and its applications
- the importance of working accurately and safely
- hazard identification and risk assessment
- risk factors and risk assessment in the context of potential benefit
- the use of modelling, including mathematical modelling, to explain aspects of biology
- the importance of scale in terms of time, size and space in biology
- the variety of life, including microorganisms, plants and animals, and variation within species including the effects of genotype and environment
- how similarities and differences can be used to classify organisms and the importance of classification

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- how organisms have changed through time
- natural selection and how it can lead to evolutionary changes, and how genes determine the structure and function of organisms
- the need for, and development and functions of, specialised organ systems
- the interdependence of organisms and their adaptations to their environment
- fieldwork techniques to explore the relationships between communities of organisms and their environments
- how environmental change is measured including using living and non-living indicators
- energy flow through the biosphere
- cycling and recycling of nutrients including the roles of microorganisms
- the production, use and disposal of materials and how an understanding of biology helps to reduce the resulting impacts on the environment
- the structure of cells including plant, animal and microbial cells
- mitosis and meiosis
- how chemical reactions essential for life take place inside and outside cells
- photosynthesis and respiration
- the structure and function of DNA and its role in protein synthesis
- the structure and functions of proteins including enzyme action
- the different patterns of growth and development in plants and animals
- how animals and plants respond to external and internal changes, and how organisms regulate internal systems
- how human health is affected by a range of environmental and inherited factors, by the use and misuse of drugs and by medical treatment.

Skills

This Edexcel GCSE in Biology provides students with the opportunity to develop the ability to:

- develop hypotheses and plan practical ways to test them including risk assessment; manage risks when carrying out practical work; collect, process, analyse and interpret primary and secondary data including the use of appropriate technology to draw evidence-based conclusions; review methodology to assess fitness for purpose, and review hypotheses in light of outcomes
- use scientific theories, models and evidence to develop hypotheses, arguments and explanations; develop and use models to explain systems, processes and abstract ideas
- communicate scientific information using scientific, technical and mathematical language, conventions and symbols.

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How Science Works

The GCSE in Biology requires the students to develop the skills, knowledge and understanding of *How Science Works*, described as follows.

Data, evidence, theories and explanations

1. the collection and analysis of scientific data
2. the interpretation of data, using creative thought, to provide evidence for testing ideas and developing theories
3. many phenomena can be explained by developing and using scientific theories, models and ideas
4. there are some questions that science cannot currently answer and some that science cannot address

Practical and enquiry skills

5. planning to test a scientific idea, answer a scientific question or solve a scientific problem
6. collecting data from primary or secondary sources, including the use of ICT sources and tools
7. working accurately and safely, individually and with others, when collecting first-hand data
8. evaluating methods of data collection and considering their validity and reliability as evidence

Communication skills

9. recalling, analysing, interpreting, applying and questioning scientific information or ideas
10. using both qualitative and quantitative approaches
11. presenting information, developing an argument and drawing a conclusion, and using scientific, technical and mathematical language, conventions and symbols and ICT tools

Applications and implications of science

12. the use of contemporary science and technological developments and their benefits, drawbacks and risks
13. how and why decisions about science and technology are made, including those that raise ethical issues, and about the social, economic and environmental effects of such decisions
14. how uncertainties in scientific knowledge and scientific ideas change over time and the role of the scientific community in validating these changes.

Mathematical skills

Students should be able to:

1. understand number size and scale and the quantitative relationship between units
2. understand when and how to use estimation
3. carry out calculations involving +, − , ×, ÷, either singly or in combination, decimals, fractions, percentages and positive whole number powers
4. provide answers to calculations to an appropriate number of significant figures
5. understand and use the symbols =, <, >, ~
6. understand and use direct proportion and simple ratios
7. calculate arithmetic means
8. understand and use common measures and simple compound measures such as speed
9. plot and draw graphs (line graphs, bar charts, pie charts, scatter graphs, histograms) selecting appropriate scales for the axes
10. substitute numerical values into simple formulae and equations using appropriate units
11. translate information between graphical and numeric form
12. extract and interpret information from charts, graphs and tables
13. understand the idea of probability
14. calculate area, perimeters and volumes of simple shapes

In addition, higher tier students should be able to:

15. interpret, order and calculate with numbers written in standard form
16. carry out calculations involving negative powers (only −1 for rate)
17. change the subject of an equation
18. understand and use inverse proportion
19. understand and use percentiles and deciles.

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List of unit contents

Unit B1: Influences on life

Topic 1 Classification, variation and inheritance

Topic 2 Responses to a changing environment

Topic 3 Problems of, and solutions to a changing environment

Unit B2: The components of life

Topic 1 The building blocks of cells

Topic 2 Organisms and energy

Topic 3 Common systems

Unit B3: Using biology

Topic 1 Control systems

Topic 2 Behaviour

Topic 3 Biotechnology

Unit BCA: Biology controlled assessment

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Unit B1: Influences on life

Overview

Content and How Science Works overview

In Unit B1 students study three topics that enable them to find out more about how they fit into the world and how organisms are affected by and respond to internal and external influences.

Practical investigations throughout the unit will give students opportunities to plan and carry out investigations. They will devise their own models and evaluate them. They will also assess and manage risks, trial their plans and consider how the quality of their data might be improved. They will analyse data, draw conclusions providing evidence to support their conclusions, and evaluate to what degree the conclusion supports the hypothesis.

Throughout the unit, students will have the opportunity to improve and demonstrate mathematical skills. This includes learning about direct proportion and simple ratios, calculating arithmetic means, plotting and drawing graphs (line graphs, bar charts, pie charts, scatter graphs, histograms), selecting appropriate scales for the axes, translating information between graphical and numeric form, extracting and interpreting information from charts, graphs and tables, and understanding the idea of probability.

Topic 1 explores the general characteristics of animals and plants, and then looks more closely at the five vertebrate groups and organisms that can survive in extreme environments. In this topic students will learn about the problems of classifying some organisms and will study variation, as well as the basic principles of inheritance and Darwin's theory of evolution by natural selection.

Work on classification systems shows students how data collected over time can have different interpretations and how ideas and theories change as more data is collected. The evidence we now have to support Darwin's theory of natural selection illustrates the importance of collecting data to develop and test theories.

Work on food chains, the process of natural selection and patterns of inheritance provides opportunities to use models and theories to explain observed data.

Students will critically evaluate evidence, suggesting reasons for inconsistencies in the data collected and ways to improve precision or reproducibility of results. Students will have the opportunity to work quantitatively when collecting data and in studying percentage probabilities and biomass and energy in food chains.

In Topic 2 students will investigate how humans detect and respond to changes in their external and internal environments, including the role of hormones and the nervous system. Students will also explore the role of hormones in plants in terms of responding to stimuli.

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Work on how organisms respond to change provides opportunities to see how phenomena can be explained by developing and using scientific theories, models and ideas.

Students will present information, develop arguments and draw conclusions using scientific, technical and mathematical language, conventions and symbols and ICT tools when investigating how organisms respond to change and how blood glucose levels are regulated.

Students will consider the use of contemporary science and technological developments and their benefits, drawbacks and risks when exploring the links between obesity and Type 2 diabetes, and in the commercial use of plant hormones.

Topic 3 begins by looking at the ways in which the functioning of the body is affected by external factors such as drugs and pathogens. Students will also discover how scientists have contributed to the development and use of antibiotics and antiseptics. They will go on to learn about the interdependence of organisms on Earth and natural nutrient cycles, before finding out how chemicals produced by human activities can pollute the planet on which they live.

Work on the carbon and nitrogen cycles provides opportunities to use models and theories to explain observed data.

Students will consider how decisions about, for example, smoking, drug or alcohol policies, are informed by scientific evidence of the effect on the human body. However, these decisions cannot be made using science alone as there are implications for society. We must also consider ethical issues when deciding whether to use technology; for example, when deciding whether a patient is suitable for an organ transplant.

Throughout the unit students will learn about the importance of the application of biology to improving health and food production, such as the development of new drugs and antibiotics, and the commercial uses of plant hormones. They will evaluate the advantages, disadvantages and risks of the use or misuse of drugs, and consider how decisions such as whether or not to recycle waste are taken.

Assessment overview

This unit is externally assessed, through a one hour, 60 mark, tiered written examination, containing six questions.

The examination will contain a mixture of question styles, including objective questions, short answer questions and extended writing questions.

Practical investigations in this unit

Within this unit, students will develop an understanding of the process of scientific investigations, including that investigations:

- use hypotheses which are tested
- require assessment and management of risks
- require the collection, presentation, analysis and interpretation of primary and secondary evidence including the use of appropriate technology
- should include a review of methodology to assess fitness for purpose
- should include a review of hypotheses in the light of outcomes.

The following specification points are practical investigations that exemplify the scientific process and may appear in the written examination for this unit:

1.14 *Investigate the variations within a species to illustrate continuous variation and discontinuous variation*

2.16 *Investigate tropic responses*

2.22 *Investigate human responses to external stimuli*

3.3 *Investigate reaction times*

3.15 *Investigate the effects of antiseptics or antibiotics on microbial cultures*

3.23 *Investigate the effect of pollutants on plant germination and plant growth*

The following are further suggestions for practical work within this unit:

- *Investigate inheritance using suitable organisms or models*
- *Investigate the speed of transmission of electrical impulses in the nervous system*
- *Investigate the presence of sugar in simulated urine/body fluids*
- *Investigate the effect of light and/or gravity on plant growth*
- *Investigate antimicrobial properties of plants*
- *Investigate how indicator species can be used to assess levels of pollution in water or the atmosphere*

The controlled assessment task (CAT) for the GCSE in Biology will be taken from any of these practical investigations (specification points and further suggested practical work). This task will change every year, so future CATs will be chosen from this list.

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Detailed unit content

In this specification bold text refers to higher tier only content. Italic text refers to practical investigations, which students are required to demonstrate an understanding of.

Topic 1

Classification, variation and inheritance

1.1 Demonstrate an understanding of how biologists classify organisms according to how closely they are related to one another including:

- a Species – groups of organisms that have many features in common
- b Genus – contains several species with similar characteristics
- c Family – comprising of several genera
- d Order – comprising of several families
- e Class – comprising of several orders
- f Phylum – comprising of several classes
- g The Five Kingdoms – animalia, plantae, fungi, protoctista and prokaryotes

1.2 Describe the main characteristics of the five kingdoms including:

- a Animalia – multicellular, do not have cell walls, do not have chlorophyll, feed heterotrophically
- b Plantae – multicellular, have cell walls, have chlorophyll, feed autotroprically
- c Fungi – multicellular, have cell walls, do not have chlorophyll, feed saprophytically
- d Protoctista – unicellular, have a nucleus
- e Prokaryotes – unicellular, have no nucleus

1.3 Explain why scientists do not classify viruses in any of the five kingdoms and regard them as non-living

1.4 Describe the main characteristics of the phylum Chordata as animals with a supporting rod running the length of the body, an example of this being the backbone in vertebrates

1.5 Explain how scientists place vertebrates into groups based on:

- a Oxygen absorption methods – lungs, gills and skin
- b Reproduction – internal or external fertilisation, oviparous or viviparous
- c Thermoregulation – homeotherms and poikilotherms

1.6 Demonstrate an understanding of the problems associated with assigning vertebrates to a specific group based on their anatomy and reproduction methods and why many vertebrates are difficult to classify

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1.7 Discuss why the definition of a species as organisms that produce fertile offspring may have limitations: some organisms do not always reproduce sexually and some hybrids are fertile

1.8 **Explain why binomial classification is needed to identify, study and conserve species, and can be used to target conservation efforts**

1.9 Explain how accurate classification may be complicated by:

- a variation within a species
- b **hybridisation in ducks**
- c **ring species**

1.10 Construct and use keys to show how species can be identified

1.11 Explain how organisms are adapted to their environment and how some organisms have characteristics that enable them to survive in extreme environments, including deep-sea hydrothermal vents and polar regions

1.12 Demonstrate an understanding of Darwin's theory of evolution by natural selection including:

- a variation – most populations of organisms contain individuals which vary slightly from one to another
- b over-production – most organisms produce more young than will survive to adulthood
- c struggle for existence – because populations do not generally increase rapidly in size there must therefore be considerable competition for survival between the organisms
- d survival- those with advantageous characteristics are more likely to survive this struggle
- e advantageous characteristics inherited – better adapted organisms are more likely to reproduce successfully passing on the advantageous characteristics to their offspring
- f gradual change – over a period of time the proportion of individuals with the advantageous characteristics in the population will increase compared with the proportion of individuals with poorly adapted characteristics, and the poorly adapted characteristics may eventually be lost

1.13 Describe variation as continuous or discontinuous

1.14 *Investigate the variations within a species to illustrate continuous variation and discontinuous variation*

1.15 Interpret information on variation using normal distribution curves

1.16 Demonstrate an understanding of the causes of variation, including:

- a genetic variation – different characteristics as a result of mutation or reproduction
- b environmental variation – different characteristics caused by an organism's environment (acquired characteristics)

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1.17 **Demonstrate an understanding of how speciation occurs as a result of geographic isolation**

1.18 Explain how new evidence from DNA research and the emergence of resistant organisms supports Darwin's theory

1.19 Explain the role of the scientific community in validating new evidence, including the use of:

a scientific journals

b the peer review process

c scientific conferences

1.20 Describe the structure of the nucleus of the cell as containing chromosomes, on which genes are located

1.21 Demonstrate an understanding that genes exist in alternative forms called alleles which give rise to differences in inherited characteristics

1.22 Recall the meaning of, and use appropriately, the terms: dominant, recessive, homozygous, heterozygous, phenotype and genotype

1.23 Analyse and interpret patterns of monohybrid inheritance using a genetic diagram, Punnett squares and family pedigrees

1.24 Calculate and analyse outcomes (using probabilities, ratios and percentages) from monohybrid crosses

1.25 Describe the symptoms of the genetic disorders:

a sickle cell disease

b cystic fibrosis

1.26 **Evaluate the outcomes of pedigree analysis when screening for genetic disorders:**

a **sickle cell disease**

b **cystic fibrosis**

Topic 2

Responses to a changing environment

2.1 Define homeostasis as the maintenance of a stable internal environment

2.2 Demonstrate an understanding of the homeostatic mechanisms of:

a thermoregulation and the effect of temperature on enzymes

b osmoregulation

c blood glucose regulation

2.3 Explain how thermoregulation takes place, with reference to the function of the skin, including:

a the role of the dermis – sweat glands, blood vessels and nerve endings, hair, erector muscles and sebaceous glands

b the role of the hypothalamus – regulating body temperature

2.4 **Explain how thermoregulation takes place, with reference to:**

a **vasoconstriction**

b **vasodilation**

c **negative feedback**

2.5 Recall that hormones are produced in endocrine glands and are transported by the blood to their target organs

2.6 Explain how blood glucose levels are regulated by insulin and excess blood glucose is converted to glycogen in the liver

2.7 **Explain how blood glucose levels are regulated by glucagon causing the conversion of glycogen to glucose**

2.8 Recall that Type 1 diabetes is caused by a lack of insulin

2.9 Explain how Type 1 diabetes can be controlled, including the roles of diet and injection of insulin usually into the subcutaneous fat

2.10 Explain how, in Type 1 diabetes, the level of physical activity and diet affect the amount of insulin required

2.11 Recall that Type 2 diabetes is caused by a person becoming resistant to insulin

2.12 Explain how Type 2 diabetes can be controlled by diet and physical activity

2.13 Evaluate the correlation between obesity (including calculations of BMI) and Type 2 diabetes

2.14 Explain how plant growth substances (hormones) bring about:

a positive phototropism in shoots

b positive gravitropism (geotropism) in roots

2.15 Explain how auxins bring about shoot curvature using cell elongation

2.16 *Investigate tropic responses*

2.17 Analyse, interpret and evaluate data from plant hormone experiments, including the action of auxins and gibberellins

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2.18 **Demonstrate an understanding of the uses of plant hormones, including:**

- a **selective weedkillers**
- b **rooting powder**
- c **seedless fruit**
- d **fruit ripening**

2.19 Recall that the central nervous system consists of the brain and spinal cord and is linked to sense organs by nerves

2.20 Explain the structure and function of dendrons and axons in the nervous system

2.21 Describe how stimulation of receptors in the sense organs sends electrical impulses along neurones

2.22 *Investigate human responses to external stimuli*

2.23 Describe the structure and function of sensory, relay and motor neurones and synapses including:

- a the role of the myelin sheath
- b the role of neurotransmitters
- c the reflex arc

Topic 3

Problems of, and solutions to a changing environment

3.1 Define a drug as a chemical substance, such as a narcotic or hallucinogen, that affects the central nervous system, causing changes in psychological behaviour and possible addiction

3.2 Describe the general effects of:

- a painkillers that block nerve impulses, including morphine
- b hallucinogens that distort sense perception, including LSD
- c stimulants that increase the speed of reactions and neurotransmission at the synapse, including caffeine
- d depressants that slow down the activity of the brain, including alcohol

3.3 *Investigate reaction times*

3.4 Explain the effects of some chemicals in cigarette smoke, including:

- a nicotine as an addictive drug
- b tar as a carcinogen
- c carbon monoxide reducing the oxygen-carrying ability of the blood

3.5 Evaluate data relating to the correlation between smoking and its negative effects on health

3.6 Evaluate evidence of some harmful effects of alcohol abuse:

- a in the short term – blurred vision, lowering of inhibitions, slowing of reactions
- b in the long term – liver cirrhosis, brain damage

3.7 Discuss the ethics of organ transplants, including:

- a liver transplants for alcoholics
- b heart transplants for the clinically obese
- c the supply of organs

3.8 Recall that infectious diseases are caused by pathogens

3.9 Describe how pathogens are spread, including:

- a in water, including cholera bacterium
- b by food, including *Salmonella* bacterium
- c airborne (eg sneezing), including influenza virus
- d by contact, including athlete's foot fungus
- e by body fluids, including HIV
- f by animal vectors, including:
  - i housefly: dysentery bacterium
  - ii *Anopheles* mosquito: malarial protozoan

3.10 Explain how the human body can be effective against attack from pathogens, including:

- a physical barriers – skin, cilia, mucus
- b chemical defence – hydrochloric acid in the stomach, lysozymes in tears

3.11 Demonstrate an understanding that plants produce chemicals that have antibacterial effects in order to defend themselves, some of which are used by humans

3.12 Describe how antiseptics can be used to prevent the spread of infection

3.13 Explain the use of antibiotics to control infection, including:

- a antibacterials to treat bacterial infections
- b antifungals to treat fungal infections

3.14 **Evaluate evidence that resistant strains of bacteria, including MRSA, can arise from the misuse of antibiotics**

3.15 *Investigate the effects of antiseptics or antibiotics on microbial cultures*

3.16 Recall that interdependence is the dynamic relationship between all living things

3.17 Demonstrate an understanding of how some energy is transferred to less useful forms at each trophic level and this limits the length of a food chain

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3.18 Demonstrate an understanding that the shape of a pyramid of biomass is determined by energy transferred at each trophic level

3.19 Explain how the survival of some organisms may depend on the presence of another species:

- a parasitism, including:
  - i fleas
  - ii head lice
  - iii tapeworms
  - iv mistletoe
- b mutualism, including:
  - i oxpeckers that clean other species
  - ii cleaner fish
  - iii **nitrogen-fixing bacteria in legumes**
  - iv **chemosynthetic bacteria in tube worms in deep-sea vents**

3.20 Analyse, interpret and evaluate data on global population change

3.21 Explain how the increase in human population contributes to an increase in the production of pollutants, including phosphates, nitrates and sulfur dioxide

3.22 Explain how eutrophication occurs and the problems associated with eutrophication in an aquatic environment

3.23 *Investigate the effect of pollutants on plant germination and plant growth*

3.24 Demonstrate an understanding of how scientists can use the presence or absence of indicator species as evidence to assess the level of pollution:

- a polluted water indicator – bloodworm, sludgeworm
- b clean water indicator – stonefly, freshwater shrimps
- c air quality indicator – lichen species, blackspot fungus on roses

3.25 Demonstrate an understanding of how recycling can reduce the demand for resources and the problem of waste disposal, including paper, plastics and metals

3.26 Demonstrate an understanding of how carbon is recycled:

- a during photosynthesis plants remove carbon dioxide from the atmosphere
- b carbon compounds pass along a food chain
- c during respiration organisms release carbon dioxide into the atmosphere
- d decomposers release carbon dioxide into the atmosphere
- e combustion of fossil fuels releases carbon dioxide into the atmosphere

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3.27 **Demonstrate an understanding of how nitrogen is recycled:**

a **nitrogen gas in the air cannot be used directly by plants and animals**

b **nitrogen-fixing bacteria living in root nodules or the soil can fix nitrogen gas**

c **the action of lightning can convert nitrogen gas into nitrates**

d **decomposers break down dead animals and plants**

e **soil bacteria convert proteins and urea into ammonia**

f **nitrifying bacteria convert this ammonia to nitrates**

g **plants absorb nitrates from the soil**

h **nitrates are needed by plants to make proteins for growth**

i **nitrogen compounds pass along a food chain or web**

j **denitrifying bacteria convert nitrates to nitrogen gas**

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Unit B2: The components of life

Overview

Content and How Science Works overview

The three topics in Unit B2 allow a more in-depth study of the structure, development and functioning of organisms. This includes the role of various organ systems in animals and plants.

Practical work throughout the unit will give students opportunities to plan and carry out investigations. They will devise their own models and evaluate them, assess and manage risks, trial their plans and consider how the quality of their data might be improved. They will analyse data, draw conclusions providing evidence to support their conclusions, and evaluate to what degree the conclusions support the hypothesis.

Throughout the unit, students will have the opportunity to improve and demonstrate mathematical skills, including understanding number size and scale, using estimation, understanding and using direct proportion and simple ratios, calculating arithmetic means, plotting and drawing graphs (line graphs, bar charts, pie charts, scatter graphs, histograms), selecting appropriate scales for the axes, translating information between graphical and numeric form, extracting and interpreting information from charts, graphs and tables and understanding the idea of probability.

Topic 1 compares the structure of animal, bacterial and plant cells. Students will learn about the relationship between genes and DNA and find out how cells divide. Exciting scientific developments such as genetic engineering, the Human Genome Project and the use of stem cells are key aspects of this topic. Enzyme properties and the principles of enzyme action are important areas of biology also covered.

The impact of developments in science, including the advantages, disadvantages and risks, will be covered in relation to genetic modification and cloning. There will be opportunities to explore the issues raised by social, economic and environmental effects of developing scientific knowledge, such as in cloning and stem cell research.

Work on cell structure, protein synthesis and the way enzymes work will give students experience in evaluating models and their importance in the development of our understanding of biological processes. Students will also explore the way that scientific ideas develop as a result of the collaboration of scientists, such as in the Human Genome Project, and the importance of creative thought in developing ideas, such as how DNA structure links to protein structure.

In Topic 2 students will learn about the differences between aerobic and anaerobic respiration and investigate the relationship between exercise, breathing rate and heart rate. They go on to study important processes in plants including photosynthesis and water movement. The final section of Topic 2 allows students to explore the relationship between organisms and their environment.

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Students will be expected to present data that they have collected, using the appropriate conventions and language, in order to develop arguments and draw conclusions when investigating photosynthesis and respiration. Students will also evaluate 'scientific' claims made in the media about new scientific developments, such as in adverts for energy-boosting products, and how science as yet does not have answers to some questions about these.

Topic 3 includes an interesting study of fossils and the fossil record. Students will also learn about the structure and functions of blood and the heart, and look at the role of blood vessels. Parts of the digestive system and their functions are key areas of human biology and up-to-date issues such as the use of prebiotics and probiotics are discussed.

Students will also evaluate 'scientific' claims made in the media about new scientific developments, such as in adverts for probiotics, and how science as yet does not have answers to some questions about these.

Assessment overview

This unit is externally assessed, through a one hour, 60 mark, tiered written examination, containing six questions.

The examination will contain a mixture of question styles, including objective questions, short answer questions and extended writing questions.

Practical investigations in this unit

Within this unit, students will develop an understanding of the process of scientific investigations, including that investigations:

- use hypotheses which are tested
- require assessment and management of risks
- require the collection, presentation, analysis and interpretation of primary and secondary evidence including the use of appropriate technology
- should include a review of methodology to assess fitness for purpose
- should include a review of hypotheses in the light of outcomes.

The following specification points are practical investigations that exemplify the scientific process and may appear in the written examination for this unit:

1.8 *Investigate how to extract DNA from cells*

1.32 *Investigate the factors that affect enzyme activity*

2.5 *Investigate the effect of exercise on breathing rate and heart rate*

2.16 *Investigate how factors, including the effect of light intensity, CO_2 concentration or temperature, affect the rate of photosynthesis*

2.21 *Investigate osmosis*

2.22 *Investigate the relationship between organisms and their environment using fieldwork techniques*

2.23 *Investigate the distribution of organisms in an ecosystem, using sampling techniques including:*

a *pooters*

b *sweep nets/pond nets*

c *pitfall traps*

d *quadrats*

and measure environmental factors including:

e *temperature*

f *light intensity*

g *pH*

3.17 *Investigate the effect of different concentrations of digestive enzymes, using and evaluating models of the alimentary canal*

The following are further suggestions for practical work within this unit:

- *Investigate plant and animal cells with a light microscope*
- *Investigate the effect of concentration on rate of diffusion*
- *Investigate the effect of glucose concentration on rate of anaerobic respiration in yeast*
- *Investigate the increase in heart rate and/or breathing rate with exercise*

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- *Investigate how the structure of the leaf is adapted for photosynthesis*
- *Investigate how the loss of water vapour from leaves drives transpiration*

The controlled assessment task (CAT) for the GCSE in Biology will be taken from any of these practical investigations (specification points and further suggested practical work). This task will change every year, so future CATs will be chosen from this list.

Detailed unit content

In this specification bold text refers to higher tier only content. Italic text refers to practical investigations, which students are required to demonstrate an understanding of.

Topic 1

The building blocks of cells

1.1 Describe the function of the components of a bacterial cell including chromosomal DNA, plasmid DNA, flagella and cell wall

1.2 Describe the function of the components of a plant cell including chloroplast, large vacuole, cell wall, cell membrane, mitochondria, cytoplasm and nucleus

1.3 Describe the function of the components of an animal cell including cell membrane, mitochondria, cytoplasm and nucleus

1.4 Describe how plant and animal cells can be studied in greater detail with a light microscope

1.5 Demonstrate an understanding of how changes in microscope technology have enabled us to see cells with more clarity and detail than in the past, including simple magnification calculations

1.6 Recall that a gene is a section of a molecule of DNA and that it codes for a specific protein

1.7 Describe a DNA molecule as:

- a two strands coiled to form a double helix
- b strands linked by a series of complementary base pairs joined together by weak hydrogen bonds:
  - i adenine (A) with thymine (T)
  - ii cytosine (C) with guanine (G)

1.8 *Investigate how to extract DNA from cells*

1.9 Explain how the structure of DNA was discovered, including the roles of the scientists Watson, Crick, Franklin and Wilkins

1.10 **Demonstrate an understanding of the implications of sequencing the human genome (Human Genome Project) and of the collaboration that took place within this project**

1.11 Demonstrate an understanding of the process of genetic engineering, including the removal of a gene from the DNA of one organism and the insertion of that gene into the DNA of another organism

1.12 Discuss an understanding of the advantages and disadvantages of genetic engineering to produce GM organisms, including:

- a beta carotene in golden rice to reduce vitamin A deficiency in humans
- b the production of human insulin by genetically modified bacteria
- c the production of herbicide-resistant crop plants

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1.13 Describe the division of a cell by mitosis as the production of two daughter cells, each with identical sets of chromosomes in the nucleus to the parent cell, and that this results in the formation of two genetically identical diploid body cells

1.14 Recall that mitosis occurs during growth, repair and asexual reproduction

1.15 Recall that, at fertilisation, haploid gametes combine to form a diploid zygote

1.16 Describe the division of a cell by meiosis as the production of four daughter cells, each with half the number of chromosomes, and that this results in the formation of genetically different haploid gametes

1.17 Recall that cloning is an example of asexual reproduction that produces genetically identical copies

1.18 **Demonstrate an understanding of the stages in the production of cloned mammals, including:**

- a **removal of diploid nucleus from a body cell**
- b **enucleation of egg cell**
- c **insertion of diploid nucleus into enucleated egg cell**
- d **stimulation of the diploid nucleus to divide by mitosis**
- e **implantation into surrogate mammals**

1.19 Demonstrate an understanding of the advantages, disadvantages and risks of cloning mammals

1.20 Recall that stem cells in the embryo can differentiate into all other types of cells, but that cells lose this ability as the animal matures

1.21 Demonstrate an understanding of the advantages, disadvantages and risks arising from adult and embryonic stem cell research

1.22 Describe how the order of bases in a section of DNA decides the order of amino acids in the protein

1.23 **Demonstrate an understanding of the stages of protein synthesis, including transcription and translation:**

- a **the production of complementary mRNA strand in the nucleus**
- b **the attachment of the mRNA to the ribosome**
- c **the coding by triplets of bases (codons) in the mRNA for specific amino acids**
- d **the transfer of amino acids to the ribosome by tRNA**
- e **the linking of amino acids to form polypeptides**

1.24 Describe each protein as having its own specific number and sequence of amino acids, resulting in different-shaped molecules that have different functions, including enzymes

1.25 Demonstrate an understanding of how gene mutations change the DNA base sequence and that mutations can be harmful, beneficial or neither

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1.26 Describe enzymes as biological catalysts

1.27 Demonstrate an understanding that enzymes catalyse chemical reactions occurring inside and outside living cells, including:

- a DNA replication
- b protein synthesis
- c digestion

1.28 Describe the factors affecting enzyme action, including:

- a temperature
- b substrate concentration
- c pH

1.29 Recall that enzymes are highly specific for their substrate

1.30 Demonstrate an understanding of the action of enzymes in terms of the 'lock-and-key' hypothesis

1.31 Describe how enzymes can be denatured due to changes in the shape of the active site

1.32 *Investigate the factors that affect enzyme activity*

Topic 2

Organisms and energy

2.1 Recall that respiration is a process used by all living organisms that releases the energy in organic molecules

2.2 Explain how the human circulatory system facilitates respiration, including:

- a glucose and oxygen diffuses from capillaries into respiring cells
- b carbon dioxide diffuses from respiring cells into capillaries

2.3 Define diffusion as the movement of particles from an area of high concentration to an area of lower concentration

2.4 Demonstrate an understanding of how aerobic respiration uses oxygen to release energy from glucose and how this process can be modelled using the word equation for aerobic respiration

2.5 *Investigate the effect of exercise on breathing rate and heart rate*

2.6 Explain why heart rate and breathing rate increase with exercise

2.7 Calculate heart rate, stroke volume and cardiac output, using the equation cardiac output = stroke volume × heart rate

2.8 Demonstrate an understanding of why, during vigorous exercise, muscle cells may not receive sufficient oxygen for their energy requirements and so start to respire anaerobically

2.9 Demonstrate an understanding of how anaerobic respiration releases energy from glucose and how this process can be modelled using the word equation for anaerobic respiration

2.10 Recall that the process of anaerobic respiration releases less energy than aerobic respiration

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2.11 Describe how a build-up of lactic acid requires extra oxygen to break it down. This is called excess post-exercise oxygen consumption or EPOC (formerly known as oxygen debt)

2.12 Explain why heart rate and breathing rate remain high after exercise

2.13 Describe how the structure of a leaf is adapted for photosynthesis, including:

a large surface area

b containing chlorophyll in chloroplasts to absorb light

c stomata for gas exchange (carbon dioxide, oxygen and water vapour)

2.14 Demonstrate an understanding of how photosynthesis uses light energy to produce glucose and how this process can be modelled using the word equation for photosynthesis

2.15 Demonstrate an understanding of how limiting factors affect the rate of photosynthesis, including:

a light intensity

b CO_2 concentration

c temperature

2.16 *Investigate how factors, including the effect of light intensity, CO_2 concentration or temperature, affect the rate of photosynthesis*

2.17 Explain how the loss of water vapour from leaves drives transpiration

2.18 Explain how water, glucose and mineral salts are transported through a plant, including:

a mineral uptake in roots by active transport

b the role of the xylem and phloem vessels

2.19 Describe how root hair cells are adapted to take up water by osmosis

2.20 Define osmosis as the movement of water molecules from an area of higher concentration of water to an area of lower concentration of water through a partially permeable membrane

2.21 *Investigate osmosis*

2.22 *Investigate the relationship between organisms and their environment using fieldwork techniques*

2.23 *Investigate the distribution of organisms in an ecosystem, using sampling techniques including:*

a *pooters*

b *sweep nets/pond nets*

c *pitfall traps*

d *quadrats*

and measure environmental factors including:

e *temperature*

f *light intensity*

g *pH*

Topic 3

Common systems

3.1 Evaluate the evidence for evolution based on the fossil record

3.2 Explain why there are gaps in the fossil record, including:

a because fossils do not always form

b because soft tissue decays

c because many fossils are yet to be found

3.3 **Explain how the anatomy of the pentadactyl limb provides scientists with evidence for evolution**

3.4 Describe growth in terms of increase in size, length and mass

3.5 Interpret growth data in terms of percentile charts

3.6 Explain how cell division, elongation and differentiation contribute to the growth and development of a plant

3.7 Explain how cell division and differentiation contribute to the growth and development of an animal

3.8 Recall the structure and function of the following parts of the blood, including:

a red blood cells

b white blood cells

c plasma

d platelets

3.9 Describe the grouping of cells into tissues, tissues into organs, and organs into organ systems

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3.10 Explain how the structure of the heart is related to its function, including:

- a the four major blood vessels associated with the heart (pulmonary artery, pulmonary vein, aorta, vena cava)
- b left atrium and ventricle to pump oxygenated blood
- c right atrium and ventricle to pump deoxygenated blood
- d valves to prevent backflow (names not required)
- e left ventricle has a thicker muscle wall than the right ventricle
- f the direction of blood flow through the heart

3.11 Describe how the circulatory system transports substances around the body, including:

- a arteries transport blood away from the heart
- b veins transport blood to the heart
- c capillaries exchange materials with tissues

3.12 Describe the functions of the parts of the digestive system, including:

- a mouth
- b oesophagus
- c stomach
- d small and large intestines
- e pancreas
- f liver
- g **gall bladder**

3.13 Explain the role of the muscular wall of the alimentary canal in peristalsis

3.14 Explain the role of digestive enzymes, including:

- a carbohydrases, including amylase, which digest starch to simple sugars
- b proteases, including pepsin, which digest proteins to amino acids
- c lipase, which digests fats to fatty acids and glycerol

3.15 **Explain the role of bile in neutralising stomach acid and emulsifying fats**

3.16 **Explain how the structure of villi (large surface area, single layer of cells and capillary network) allows efficient absorption of the soluble products of digestion**

3.17 *Investigate the effect of different concentrations of digestive enzymes, using and evaluating models of the alimentary canal*

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3.18 Evaluate the evidence for the claimed benefits of the use of functional foods as part of a healthy diet, including:

a probiotics containing Bifidobacteria and lactic acid bacteria Lactobacillus

b prebiotic oligosaccharides

c plant stanol esters

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Unit B3: Using biology

Overview

Content and How Science Works overview

In Unit B3 students study three topics that give them the opportunity to explore some areas of biology in more depth. The aim is to engender an interest in biology that makes them want to pursue the subject further or simply enjoy finding out more about themselves, other organisms and the applications of biology in the world in which they live.

Practical work throughout the unit will give students opportunities to plan and carry out investigations, to devise their own models and evaluate them, to assess and manage risks, to trial their plans and consider how the quality of their data might be improved. It also enables them to analyse data, to draw conclusions providing evidence to support their conclusions, and evaluate to what degree the conclusion supports the hypothesis.

Throughout the unit, students will have the opportunity to improve and demonstrate mathematical skills, including understanding and using direct proportion and simple ratios, calculating arithmetic means, plotting and drawing graphs (line graphs, bar charts, pie charts, scatter graphs, histograms) selecting appropriate scales for the axes, translating information between graphical and numeric form, extracting and interpreting information from charts, graphs and tables and understanding the idea of probability.

There are several opportunities to investigate the way scientists collect data, such as in the screening of plants for medical properties, and to see how this data is used to produce advances in science, such as in medical treatment. Further research on these advances highlights drawbacks and risks as well as advantages, and these aspects will be studied in relation to the use of dialysis, contraception and fertility treatments. With many treatments decisions need to be made about the social, economic and environmental effects, and some of these will be explored in the context of immunisation programmes.

Students are always fascinated by the complex functions of the human body. Topic 1 enables them to study systems and processes with which they are largely unfamiliar, for example the structure and function of the kidney, and hormonal control of the menstrual cycle. A study of sex-linked disorders and the principles of immunisation add to the variety of this topic.

The way scientific ideas change over time, and the role of the scientific community in validating those changes, will be considered when studying the role of Jenner in the development of immunisation.

In Topic 2 students will study different types of behaviour, such as courtship and conditioning. Methods of communication within the animal kingdom are also areas of great interest and the work of ethologists such as Tinbergen and Fossey is covered. Different types of evidence for human evolution are looked at in some depth in the final part of Topic 2.

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The study of animal and plant behaviour will provide opportunities to see how scientists gather data and use it to construct theories that can be scientifically tested, and then to see how these theories are applied to explain further observations. The continuing development of scientific knowledge, and the fact that science cannot answer all questions, will be explored in the studies of animal behaviour and human migration.

The focus of Topic 3 is on biotechnology and its applications, covering up-to-date issues such as the use of enzyme technology in the manufacture of vegetarian cheese, sweets and biological washing powders. Ethical issues are considered with respect to the genetic modification of crop plants, for example to confer herbicide resistance and insect resistance.

Assessment overview

This unit is externally assessed, through a one hour, 60 mark, tiered written examination, containing six questions.

The examination will contain a mixture of question styles, including objective questions, short answer questions and extended writing questions.

Practical investigations in this unit

Within this unit, students will develop an understanding of the process of scientific investigations, including that investigations:

- use hypotheses which are tested
- require assessment and management of risks
- require the collection, presentation, analysis and interpretation of primary and secondary evidence including the use of appropriate technology
- should include a review of methodology to assess fitness for purpose
- should include a review of hypotheses in the light of outcomes.

The following specification points are practical investigations that exemplify the scientific process and may appear in the written examination for this unit:

1.28 *Investigate the conditions affecting growth of microorganisms (using resazurin dye)*

2.8 *Investigate animal behaviour using choice chambers*

3.4 *Investigate the effect of factors on the growth of yeast, including pH*

3.9 *Investigate the effect of different factors on yogurt making*

3.11 *Investigate the use of immobilised lactase to produce lactose-free milk*

3.12 *Investigate the use of enzymes in food production*

The following are further suggestions for practical work within this unit:

- *Investigate the importance of photoperiodicity in plants*
- *Investigate the behaviour of animals rearing their young, using video technology*
- *Investigate different behaviours exhibited by animals*
- *Investigate how animals use a variety of types of signals to communicate*
- *Investigate the use of chymosin in the manufacture of vegetarian cheese*
- *Investigate the use of invertase (sucrase) produced by Saccharomyces cerevisiae (yeast) in the manufacture of sweets*
- *Investigate the use of enzymes in washing powders*

The controlled assessment task (CAT) for the GCSE in Biology will be taken from any of these practical investigations (specification points and further suggested practical work). This task will change every year, so future CATs will be chosen from this list.

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Detailed unit content

In this specification bold text refers to higher tier only content. Italic text refers to practical investigations, which students are required to demonstrate an understanding of.

Topic 1

Control systems

1.1 Demonstrate an understanding that cell metabolism leads to the build-up of waste products in the blood, including carbon dioxide and urea

1.2 Recall that urea is produced from the breakdown of excess amino acids in the liver and is removed by the kidneys

1.3 Describe the structure of the urinary system, including:

- a renal artery and vein
- b kidneys
- c ureters
- d bladder
- e urethra

1.4 Describe possible treatments for kidney failure, including kidney dialysis and organ donation

1.5 Describe the structure of a nephron, including:

- a glomerulus and Bowman's capsule
- b convoluted tubules
- c loop of Henlé
- d collecting duct

1.6 Explain how the structure of the nephron is related to its function in filtering the blood and forming urine (osmoregulation), including:

- a filtration in the glomerulus and Bowman's capsule
- b selective reabsorption of glucose
- c reabsorption of water (osmoregulation)
- d removal of excess water in urine

1.7 **Demonstrate an understanding of the role of ADH (produced by the pituitary gland) in regulating the water content of the blood**

1.8 **Demonstrate an understanding of how ADH production is controlled by a negative feedback mechanism**

1.9 Recall that the menstrual cycle is controlled by the hormones oestrogen and progesterone

1.10 Describe the stages of the menstrual cycle including menstruation, uterus lining thickening and ovulation

1.11 Explain why the uterus lining is maintained if fertilisation occurs

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1.12 **Demonstrate an understanding of how oestrogen, progesterone, FSH and LH control the menstrual cycle, including:**

- a **FSH stimulates maturation of follicles, which stimulates oestrogen production**
- b **oestrogen is responsible for repair of the uterus wall**
- c **high levels of oestrogen stimulate a surge in LH, which triggers ovulation**
- d **corpus luteum secretes progesterone, which maintains the lining of the uterus**
- e **progesterone inhibits FSH and LH production**
- f **during pregnancy, progesterone levels remain high**
- g **menstruation is triggered by a drop in oestrogen and progesterone levels**
- h **low progesterone levels allow an increase in FSH levels**

1.13 **Demonstrate an understanding of how the menstrual cycle is controlled by a negative feedback mechanism**

1.14 Explain how the structure of an egg is adapted to its function:

- a cytoplasm to provide nutrients
- b haploid nucleus containing one set of the genetic material
- c immediately after fertilisation the cell membrane around the egg changes to block entry of other sperm

1.15 Explain how the structure of a sperm cell is adapted to its function, including:

- a acrosome containing enzymes
- b haploid nucleus containing one set of the genetic material
- c middle section containing mitochondria
- d tail for motility

1.16 Demonstrate an understanding of the advantages and disadvantages of infertility treatments, including:

- a donation of eggs
- b *in vitro* fertilisation (IVF)
- c use of surrogate mothers
- d use of hormones

1.17 Recall that the sex of a person is controlled by one pair of chromosomes, XX in a female and XY in a male

1.18 Explain how the sex of offspring is determined at fertilisation, using a genetic diagram

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1.19 Explain (using probabilities, ratios and percentages) how sex-linked genetic disorders are inherited, including:

- a haemophilia
- b colour blindness

1.20 Describe Edward Jenner's contribution to the development of vaccines

1.21 Explain the process of immunisation, including:

- a harmless pathogen or antigenic material introduced
- b the antigens trigger an immune response which causes the production of antibodies
- c the antigens also trigger production of memory lymphocytes

1.22 Demonstrate an understanding of the advantages and risks associated with immunisation

1.23 **Describe the role of memory lymphocytes in secondary responses to antigen; interpret data showing variation in blood antibody levels in response to first and subsequent infections**

1.24 **Describe the production of monoclonal antibodies, including:**

- a **use of B lymphocytes which produce desired antibodies but do not divide**
- b **production of hybridoma cells**
- c **hybridoma cells produce antibodies and they divide**

1.25 **Demonstrate an understanding of the use of monoclonal antibodies, including:**

- a **in pregnancy testing**
- b **in diagnosis including locating the position of blood clots and cancer cells and in treatment of diseases including cancer**
- c **the advantages of using monoclonal antibodies to target specific cells compared to drug and radiotherapy treatments**

1.26 Describe how the exponential growth of a population of bacteria can lead to rapid development of an infection

1.27 Demonstrate an understanding of Louis Pasteur's contribution to the development of aseptic techniques

1.28 *Investigate the conditions affecting growth of microorganisms (using resazurin dye)*

1.29 Demonstrate an understanding that plants defend themselves against attack from pests and pathogens by producing chemicals, some of which can be used to treat human diseases, disorders or relieve symptoms

1.30 Demonstrate an understanding of the impact that attack by pests and pathogens on plants has on human food supply

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1.31 Explain the importance of photoperiodicity in plants, including
- a plant germination
- b growth
- c reproduction

1.32 Demonstrate an understanding of circadian rhythms in living organisms

Topic 2

Behaviour

2.1 Describe that sexual reproduction requires the finding and selection of a suitable mate, and can involve courtship behaviours that advertise an individual's quality

2.2 Describe how animals have different mating strategies, including:
- a a mate for life
- b several mates over a lifetime
- c a mate for a breeding season
- d several mates over one breeding season

2.3 Describe that some animals, in particular birds and mammals, have developed special behaviours for rearing their young

2.4 Demonstrate an understanding of why parental care can be a successful evolutionary strategy, including:
- a increased chance of survival of offspring
- b increased chance of parental genes being passed on by the offspring

2.5 Explain how, within the animal kingdom, parental care may involve risks to the parents

2.6 Describe the different behaviours exhibited by animals, including:
- a innate behaviour
- b imprinting
- c habituation
- d classical conditioning
- e operant conditioning

2.7 Explain how humans can make use of conditioning when training captive animals for specific purposes, including:
- a sniffer dogs
- b police horses
- c dolphins

2.8 *Investigate animal behaviour using choice chambers*

2.9 Describe how some animal behaviour requires communication

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2.10 Explain how animals use a variety of types of signals to communicate, including:

- a sound signals
- b chemical signals (pheromones)
- c visual signals (gestures, body language, facial expression)

2.11 Describe how plants can communicate using chemicals, including:

- a with animals (particularly insects)
- b with other plants

2.12 Demonstrate an understanding of the work of ethologists, including:

- a Tinbergen, innate behaviour in gulls
- b Lorenz, imprinting in geese
- c Fossey, social behaviour in gorillas
- d Goodall, social behaviour in chimpanzees

2.13 **Demonstrate an understanding of how plants and animals have co-evolved, including:**

- a **flower structure and insect behaviour in pollination**
- b **plant defence and animal metabolism**

2.14 Describe the evidence for human evolution, based on fossils, including:

- a Ardi from 4.4 million years ago
- b Lucy from 3.2 million years ago
- c Leakey's discovery of fossils from 1.6 million years ago

2.15 Describe the evidence for human evolution based on stone tools, including:

- a the development of stone tools over time
- b how these can be dated from their environment

2.16 **Describe why mitochondrial DNA provides evidence for the African Eve theory for non-Africans, including:**

- a **its inheritance down the female line**
- b **its high mutation rate**

2.17 **Demonstrate an understanding of why mitochondrial DNA is more useful than nuclear DNA for tracking human migration and evolution, including:**

- a **mitochondrial DNA is less likely to have degraded over time**
- b **mitochondrial DNA is more abundant**

2.18 Demonstrate an understanding of the impact of climate change on human behaviour, including:

- a the effect of the Ice Age
- b human migration

Topic 3

Biotechnology

3.1 Describe biotechnology as the alteration of natural biomolecules using science and engineering to provide goods and services

3.2 Describe a fermenter as a vessel used to cultivate micro-organisms for the production of biomolecules on a large scale

3.3 Explain the need to supply suitable conditions in fermenters, and the effect they have on growth rates, including:

- a aseptic precautions
- b nutrients
- c optimum temperature
- d pH
- e oxygenation
- f agitation

3.4 *Investigate the effect of factors on the growth of yeast, including pH*

3.5 Explain the advantages of using microorganisms for food production, including:

- a rapid population growth
- b ease of manipulation
- c production independent of climate
- d use of waste products from other industrial processes

3.6 Describe how mycoprotein is manufactured, including the role of the fungus *Fusarium sp.*

3.7 Explain the advantages of using mycoprotein as a food source

3.8 Describe how bacteria are used in the production of yogurt from milk by the conversion of lactose to lactic acid

3.9 *Investigate the effect of different factors on yogurt making*

3.10 Describe the use of enzyme technology including:

- a chymosin, produced by genetically modified microorganisms, used in the manufacture of vegetarian cheese
- b invertase (sucrase) produced by Saccharomyces cerevisiae (yeast), used in the manufacture of sweets
- c enzymes used in washing powders

3.11 *Investigate the use of immobilised lactase to produce lactose-free milk*

3.12 *Investigate the use of enzymes in food production*

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3.13 **Explain recombinant DNA technology using insulin as an example, including:**

a **restriction enzymes**

b **ligase**

c **sticky ends**

3.14 Demonstrate an understanding of the impact of human population growth on global food security

3.15 Explain how *Agrobacterium tumefaciens* is used as a vector in creating transgenic plants

3.16 **Demonstrate an understanding of the advantages and disadvantages of introducing genes for insect resistance from *Bacillus thuringiensis* into crop plants**

3.17 Demonstrate an understanding of the costs and benefits of genetic modification of crop plants in the context of developed and developing countries, including the introduction of flavonoids in the purple tomato

3.18 Explain how increased food production for humans includes:

a conventional plant breeding programmes

b pest management strategies

c genetic modification

3.19 Demonstrate an understanding of the advantages and disadvantages of replacing fossil fuels with biofuels, including the facts that biofuels are renewable and that their production uses carbon dioxide but that growing the crops to make them requires land and may affect the availability of land for growing food

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Unit BCA: Biology controlled assessment

Overview

Content overview

The controlled assessment is designed to enable students to engage with the scientific process through setting a hypothesis relevant to a given set of variables and then planning an investigation, observing recording and presenting outcomes and conclusions.

The student task will consist of three parts:

Part A – Planning

Part B – Observations

Part C – Conclusions

The tasks, provided by Edexcel, will relate to the following units in this specification:

B2 – The components of life

B3 – Using biology

Students must NOT submit a controlled assessment task for B1 for this qualification.

The quality of written communication will be important in all reports produced as how students present, order and explain their work links directly to how well it is understood by the reader.

Assessment overview

- This unit is internally assessed under controlled conditions.
- There will be two tasks available each year – one task from B2 and one task from B3.
- Each task has a shelf life of one year.
- The tasks will be available to teachers one year in advance.
- Each task has three parts – Part A: Planning, Part B: Observations and Part C: Conclusions.
- The total number of marks available for the three parts is 50.
- Students must attempt all three parts of a task.
- If they attempt both tasks, then the best marks from Part A, B and C should be submitted for the unit.

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Detailed unit content

Delivery of the controlled assessment

Skills

Students should demonstrate the ability to carry out the following skills when completing a task:

a develop a hypothesis and plan practical ways to test it including risk assessment

b manage risks when carrying out practical work

c collect, process, analyse and interpret primary and secondary evidence including the use of appropriate technology to draw evidence-based conclusions

d review methodology to assess fitness for purpose, and review the hypothesis in light of outcomes.

Parts of the controlled assessment tasks

Part A – Planning (20 marks)

Includes choosing equipment, hypothesis, controls needed for the task, evidence/observations and range, identification and management of risk.

Part B – Observations (6 marks)

Includes primary and secondary evidence collection and recording.

Part C – Conclusions (24 marks)

Includes processing and presentation of evidence, quality of evidence, conclusions based on evidence, evaluation of method, evaluation of conclusion.

Student support

Where students produce a plan that is unworkable or dangerous, it is permitted for teachers to provide students with a plan, provided it is clear that students will not receive Part A marks for this plan.

Levels of control

Internal assessment under controlled conditions has levels of control for task setting, task taking and task marking. These must be adhered to when students are completing their controlled assessment tasks.

Summary of levels of control

Area	Level of control
Part A – Planning	Limited
Part B – Observations	Limited
Part C – Conclusions	High

Task setting

High level of control

A high level of control means that tasks will be set by Edexcel and centres will choose from a list of tasks, from the other units in this qualification.

The tasks will change every year, in accordance with the Ofqual regulations for GCSE Science. Teachers must take care when using these tasks to ensure that students are completing the correct task for a particular year. The front sheet of each task will show the dates for which it is valid.

When will the tasks be available?

They will be available on the Edexcel website for teachers to download a year ahead of their first assessment opportunity. Teachers can view all the task sheets available before deciding which task the students will complete.

When should the tasks be made available to students?

The task sheets for this controlled assessment are confidential and must not be shown to students before they start the tasks. Task sheets should not be shown to students until the start of the task planning stage of the controlled assessment.

Do all my students have to do the same task?

It is acceptable for all the students in a class to complete the same task. However, the same task does not have to be chosen for all students and they can work on a mixture of different tasks from B2 and B3.

The tasks will change every year, in accordance with the Ofqual regulations for GCSE Science. Teachers must take care when using these tasks to ensure that students are completing the correct task for a particular year. The front sheet of each task will show the dates for which it is valid.

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Task taking

a Research and data collection – limited level of control

Research and data collection, including practical work, will be carried out under limited control. This means that students may work collaboratively when collecting data from practical activities.

Students may carry out any secondary research whilst not being directly supervised by a teacher, for example in a library or at home. The secondary research can include extracts from books and websites.

b Analysis, conclusions and evaluation of findings – high level of control

Students will produce the analysis, conclusions and evaluation under high levels of control. This means that students must carry out this part of the write-up individually, under the supervision of a teacher.

The production of the final report will usually take place over several lessons, so the students' materials must be collected in at the end of the lesson and handed back at the beginning of the next one. Students' final reports must be produced individually.

Communication with students during the controlled assessment

Feedback can be given to students during the controlled assessment, but this must be general rather than specific feedback. Teachers may give students general feedback on:

- the equipment chosen
- the controls for the task
- data to be collected or observations to be made
- risks involved with the task
- techniques for processing data/observations
- skills involved in the conclusions and evaluation.

Students should receive a copy of the assessment criteria so that they are aware of what they need to do to access the full range of marks.

Suggested timings of each area

The suggested timings for each part of the controlled assessment task are as follows:

Part A – Planning	1 hour
Part B – Observations	1 hour
Part C – Conclusions	1 hour

Total of 3 hours

For this controlled assessment unit, it is expected that students should be given approximately 6 hours of time specifically to prepare for tasks. By using the practicals noted in the theory units, this can be achieved as part of your normal teaching.

Task marking

Task marking – medium level of control

A medium level of control means that the marking of the tasks will be carried out by teachers and moderated by Edexcel.

Marking procedure

Teachers should use the assessment criteria to mark the tasks and use the *Controlled Assessment Record Sheet* (Appendix 5) to record the marks. Edexcel will give additional guidance on the application of the generic assessment criteria in support documentation.

It is good practice for teachers to annotate students' work to show how the marks have been allocated for each section.

Submitting marks

Students must attempt all three parts of any task they do.

Final marks for each section of the student's work should be recorded on the *Controlled Assessment Record Sheet* in Appendix 5.

They don't need to submit all marks from a task but can submit the best marks from any of the tasks they have attempted.

If a mark is submitted from a task, the student response to all three parts must be marked and retained by the centre for moderation.

Each CAT may be submitted for moderation in either May (for a June session) or October (for a November session).

Health and safety

Students must observe safe practice when they are carrying out practical work. It is the responsibility of centres to carry out risk assessments for all practical work that they undertake with their students.

In this internal assessment teachers will have limited control when students are collecting their data, but it should be carried out under full supervision for health and safety reasons. The limited control means that students can work collaboratively to collect their data.

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Assessment criteria

Part A - Planning

Element	Marks		Criteria
Equipment	2	0 marks	Gives no relevant detail
		1–2 marks	a) Chooses most relevant resources/equipment b) Explains reasons for choices and choices are fully relevant to method

Element	Marks		Criteria
Controls (If variables are to be controlled, criteria a1 and b1 will be used. If there are no variables to control, criteria a2 and b2 will be used. The specific criteria needed will be in the controlled assessment task.)	6	0 marks	Gives no relevant controls
		1–2 marks	a1) Identifies one appropriate variable to control b1) Describes how this variable can be controlled OR a2) Identifies one appropriate way to control the task b2) Describes this way of controlling the task
		3–4 marks	a1) Identifies some relevant variables to control b1) Gives an appropriate description of how to control these variables OR a2) Identifies some relevant ways to control the task to produce meaningful results b2) Describes how these ways control the task
		5–6 marks	a1) Identifies a range of variables appropriate to control b1) Gives an appropriate explanation of how to control these variables OR a2) Provides a comprehensive list of relevant ways to control the task to produce meaningful results b2) Explains how these ways control the task

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Element	Marks		Criteria
Hypothesis	4	0 marks	Provides no relevant hypothesis
		1–2 marks	a) Provides a hypothesis that is appropriate for most of the task b) Partially justifies the hypothesis
		3–4 marks	a) Provides a hypothesis that is appropriate for the full scope of the task, based on relevant scientific ideas b) Justifies the hypothesis fully using relevant scientific ideas
Risks	4	0 marks	No relevant detail given
		1–2 marks	a) Identifies a relevant risk which is specific to the task b) Suggests measure(s) to manage the risk
		3–4 marks	a) Identifies most of the relevant risks which are specific to the task b) Method reflects how risks need to be managed
Overall plan	4	0 marks	Gives no relevant method
		1–2 marks	a) Method is logically ordered to produce results b) Chooses range of data/observations that would test the hypothesis
		3–4 marks	a) Method is logically ordered to produce results and includes an explanation of why it would test the hypothesis b) Chooses range of data/observations that would test the hypothesis and explains why the range was chosen
Total marks	**20**		

Part B - Observations

Element	Marks		Criteria
Primary evidence and recording	4	0 marks	Collects no primary evidence
		1 mark	Records some data/observations that are appropriate for the topic
		2 marks	Collects a suitable range of data/observations and records some appropriately (depends on the practical)
		3 marks	Collects a suitable range of data/observations and records all appropriately (depends on the practical)
		4 marks	Collects a suitable range of data/observations and records all appropriately (depends on the practical) and records further/repeat data
Secondary evidence	2	0 marks	Collects no secondary evidence
		1 mark	Collects and records secondary evidence relevant to the hypothesis in a way appropriate for the topic
		2 marks	Collects and records secondary evidence relevant to the hypothesis in a way appropriate for the topic. Comments on the quality of the sources of secondary evidence
Total marks	**6**		

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Part C - Conclusions

Element	Marks		Criteria
Processing evidence	4	0 marks	Evidence is not processed
		1–2 marks	a) Attempts to process all collected evidence, using appropriate mathematical skills b) Attempts to present the processed evidence in a way appropriate for the topic
		3–4 marks	a) Processes all collected evidence in a way that is appropriate to the task, using appropriate mathematical skills b) Presents processed evidence in a way that allows conclusions to be drawn
Quality of evidence	4	0 marks	Makes no comments on the quality of the evidence
		1–2 marks	a) Comments on the quality of the primary evidence, dealing with anomalies appropriately (if no anomalies in evidence candidates need to state this) b) Comments on the quality of the secondary evidence, dealing with anomalies appropriately (if no anomalies in evidence candidates need to state this)
		3–4 marks	a) Explains any adjustments to the evidence needed, or decision not to exclude evidence b) Takes account of anomalies in primary and secondary evidence when processing evidence (using all evidence if no anomalies)

Element	Marks		Criteria
Conclusions based on evidence	6	0 marks	Makes no relevant conclusions
		1–2 marks	a) Provides a conclusion based on all collected evidence, but does not link it to the hypothesis b) Attempts to explain the conclusion using all collected evidence, including appropriate mathematical relationships
		3–4 marks	a) Provides a conclusion which refers to the hypothesis based on all collected evidence b) Explains the conclusion using the evidence, including appropriate mathematical relationships
		5–6 marks	a) Provides a conclusion which refers to the hypothesis based on all collected evidence and relevant scientific ideas b) Explains the conclusion using relevant scientific ideas and all collected evidence, including appropriate mathematical relationships
Evaluation of conclusion	4	0 marks	Makes no relevant evaluation
		1–2 marks	a) Evaluates conclusion based on all collected evidence b) Suggests how all collected evidence can be improved to provide stronger support for the conclusion
		3–4 marks	a) Evaluates conclusion based on all collected evidence and relevant scientific ideas b) Suggests how all collected evidence can be improved and extended to provide stronger support for the conclusion

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Element	Marks		Criteria
Evaluation of method	6	0 marks	Makes no relevant evaluation
		1–2 marks	a) Identifies a strength or weakness in the method b) Suggests how to improve method and justifies comments made
		3–4 marks	a) Describes strengths or weaknesses in the method and reasons for any anomalies b) Suggests how to improve method and justifies comments made relating to the quality of the evidence collected (including reasons for anomalies)
		5–6 marks	a) Describes strengths and weaknesses in the method and relates them to the hypothesis, and reasons for any anomalies b) Suggests how to improve method, justifying comments made relating to the hypothesis and how better quality evidence could be produced (including reasons for any anomalies)
Total marks	**24**		

B Assessment

Assessment summary

Unit B1 is externally assessed by a one hour examination

Unit B2 is externally assessed by a one hour examination

Unit B3 is externally assessed by a one hour examination

Unit BCA is an internally assessed unit

Summary of table of assessment

Unit B1: Influences on life	Unit code: 5BI1F/5BI1H
• This unit is assessed through a one hour, 60 mark, tiered written examination, containing six questions. • The examination will contain a mixture of question styles, including objective questions, short answer questions and extended writing questions. • Availability: November, March and June. • First assessment: November 2011.	

Unit B2: The components of life	Unit code: 5BI2F/5BI2H
• This unit is assessed through a one hour, 60 mark, tiered written examination, containing six questions. • The examination will contain a mixture of question styles, including objective questions, short answer questions and extended writing questions. • Availability: November, March and June. • First assessment: June 2012.	

Unit B3: Using biology	Unit code: 5BI3F/5BI3H
• This unit is assessed through a one hour, 60 mark, tiered written examination, containing six questions. • The examination will contain a mixture of question styles, including objective questions, short answer questions and extended writing questions. • Availability: November, March and June. • First assessment: June 2013.	

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Unit BCA: Biology controlled assessment	Unit code: 5BH04

- This unit is internally assessed under controlled conditions.
- There will be two tasks available each year – one task from B2 and one task from B3.
- Each task has a shelf life of one year.
- The tasks will be available to teachers one year in advance.
- Each task has three parts - Part A: Planning, Part B: Observations and Part C: Conclusions.
- The total number of marks available for the three parts is 50.
- Students must attempt all three parts of a task.
- If they attempt both tasks, then the best marks from Part A, B and C should be submitted for the unit.
- Availability: November and June.
- First assessment: June 2013.

Assessment Objectives and weightings

		% in GCSE
AO1:	Recall, select and communicate their knowledge and understanding of biology	**33 – 39%**
AO2:	Apply skills, knowledge and understanding of biology in practical and other contexts	**34 – 40%**
AO3:	Analyse and evaluate evidence, make reasoned judgements and draw conclusions based on evidence	**25.5 – 28.5%**
	TOTAL	**100%**

Relationship of Assessment Objectives to units

Unit	Assessment Objective			
	AO1	**AO2**	**AO3**	**Total for AO1, AO2 and AO3**
Unit B1: Influences on life	11 – 13%	7 – 9%	4.5 – 5.5%	25%
Unit B2: The components of life	11 – 13%	7 – 9%	4.5 – 5.5%	25%
Unit B3: Using biology	11 – 13%	7 – 9%	4.5 – 5.5%	25%
Unit BCA: Biology controlled assessment	0%	13%	12%	25%
Total for GCSE in Biology	**33 – 39%**	**34 – 40%**	**25.5 – 28.5%**	**100%**

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Entering your students for assessment

Student entry

Details of how to enter students for this qualification can be found in Edexcel's Information Manual; a copy is sent to all examinations officers. The information can also be found on Edexcel's website (www.edexcel.com).

There is a requirement that at least 40 per cent of the assessment must be taken in the examination series in which certification is requested. The final qualification grade will include assessment results which satisfy this terminal requirement.

All externally assessed units will be assessed by tiered examinations. Students will need to be entered for a specific tier at the time of entry.

Forbidden combinations and classification code

Centres should be aware that students who enter for more than one GCSE qualification with the same classification code will have only one grade (the highest) counted for the purpose of the School and College Performance Tables.

Students should be advised that, if they take two qualifications with the same classification code, schools and colleges are very likely to take the view that they have achieved only one of the two GCSEs. The same view may be taken if students take two GCSE qualifications that have different classification codes but have significant overlap of content. Students who have any doubts about their subject combinations should check with the institution to which they wish to progress before embarking on their programmes.

Access arrangements and special requirements

Edexcel's policy on access arrangements and special considerations for GCE, GCSE and Entry Level aims to enhance access to the qualifications for students with disabilities and other difficulties (as defined by the Disability Discrimination Act 1995 and the amendments to the Act) without compromising the assessment of skills, knowledge, understanding or competence.

Please see the Edexcel website (www.edexcel.com) for:

- the JCQ policy Access Arrangements and Special Considerations, Regulations and Guidance Relating to Students who are Eligible for Adjustments in Examinations
- the forms to submit for requests for access arrangements and special considerations
- dates for submission of the forms.

Requests for access arrangements and special considerations must be addressed to:

Special Requirements
Edexcel
One90 High Holborn
London WC1V 7BH

Disability Discrimination Act (DDA)

Please see the Edexcel website (www.edexcel.com) for information with regard to the Disability Discrimination Act.

Controlled assessment

In controlled assessments, control levels are set for three linked processes: task setting, task taking and task marking. The control levels (high, medium or limited are dependent on the subject) are set for each process so that the overall level of control secures validity and reliability, provides good manageability for all involved and allows teachers to authenticate the student work confidently.

The summary of the controlled conditions for this qualification is shown below.

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Summary of conditions for controlled assessment

Levels of control

Internal assessment under controlled conditions has levels of control for task setting, task taking and task marking. These must be adhered to when students are completing their controlled assessment tasks.

Summary of levels of control

Area	Level of control
Part A – Planning	Limited
Part B – Observations	Limited
Part C – Conclusions	High

Task setting

High level of control

A high level of control means that tasks will be set by Edexcel and centres will choose from a list of tasks, from the other units in this qualification.

When will the tasks be available?

They will be available on the Edexcel website for teachers to download a year ahead of their first assessment opportunity. Teachers can view all the task sheets available before deciding which task the students will complete.

When should the tasks be made available to students?

The task sheets for this controlled assessment are confidential and must not be shown to students before they start the tasks. Task sheets should not be shown to students until the start of the task planning stage of the controlled assessment.

Do all my students have to do the same task?

It is acceptable for all the students in a class to complete the same task. However, the same task does not have to be chosen for all students and they can work on a mixture of different tasks from B2 and B3.

The tasks will change every year, in accordance with the Ofqual regulations for GCSE Science. Teachers must take care when using these tasks to ensure that students are completing the correct task for a particular year. The front sheet of each task will show the dates for which it is valid.

Task taking

a Research and data collection – limited level of control

Research and data collection, including practical work, will be carried out under limited control. This means that students may work collaboratively when collecting data from practical activities.

Students may carry out any secondary research whilst not being directly supervised by a teacher, for example in a library or at home. The secondary research can include extracts from books and websites.

b Analysis, conclusions and evaluation of findings – high level of control

The analysis, conclusions and evaluation will be produced by students under high levels of control. This means that this part of the write-up must be carried out individually by the students, under the supervision of a teacher.

The production of the final report will usually take place over several lessons, so the students' materials must be collected in at the end of the lesson and handed back at the beginning of the next one. Students' final reports must be produced individually.

Task marking

Task marking – medium level of control

A medium level of control means that the marking of the tasks will be carried out by teachers and moderated by Edexcel.

Internal standardisation

Teachers must show clearly how the marks have been awarded in relation to the assessment criteria. If more than one teacher in a centre is marking students' work, there must be a process of internal standardisation to ensure that there is consistent application of the assessment criteria.

Authentication

All students must sign an authentication statement. Statements relating to work not sampled should be held securely in your centre. Those that relate to sampled students must be attached to the work and sent to the moderator. In accordance with a revision to the current Code of Practice, any student unable to provide an authentication statement will receive zero credit for the component. Where credit has been awarded by a centre-assessor to sampled work without an accompanying authentication statement, the moderator will inform Edexcel and the mark will be adjusted to zero.

Further information

For more information on annotation, authentication, mark submission and moderation procedures, please refer to the *Edexcel GCSEs in Science, Additional Science, Biology, Chemistry and Physics: Instructions and administrative documentation for internally assessed units* document, which is available on the Edexcel website.

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For up-to-date advice on teacher involvement, please refer to the Joint Council for Qualifications (JCQ) *Instructions for conducting coursework/portfolio document* on the JCQ website (www.jcq.org.uk).

For up-to-date advice on malpractice and plagiarism, please refer to the Joint Council for Qualifications (JCQ) *Suspected Malpractice in Examinations: Policies and Procedures and Instructions for conducting coursework/portfolio* document on the JCQ website (www.jcq.org.uk).

Assessing your students

The first assessment opportunity for Unit B1 of this qualification will take place in the November 2011 series and in each following March, June and November series for the lifetime of the qualification. The first assessment opportunity for Unit B2 will be in June 2012 and for Unit B3 will be in June 2013 and then in each following November, March and June series for the lifetime of the qualification. The first assessment opportunity for Unit BCA of this qualification will take place in the June 2013 series and in each following November and June series for the lifetime of the qualification.

Your student assessment opportunities

GCSE in Biology

Unit	Nov 2011	March 2012	June 2012	Nov 2012	March 2013	June 2013	Nov 2013	March 2014
Unit B1: Influences on life	✓	✓	✓	✓	✓	✓	✓	✓
Unit B2: The components of life			✓	✓	✓	✓	✓	✓
Unit B3: Using biology						✓	✓	✓
Unit BCA: Biology controlled assessment						✓	✓	

Awarding and reporting

The grading, awarding and certification of this qualification will comply with the requirements of the current GCSE/GCE Code of Practice, which is published by the Office of Qualifications and Examinations Regulation (Ofqual). The GCSE qualification will be graded and certificated on an eight-grade scale from A* to G. Individual unit results will be reported.

The first certification opportunity for the Edexcel GCSE in Biology will be in 2013.

Students whose level of achievement is below the minimum judged by Edexcel to be of sufficient standard to be recorded on a certificate will receive an unclassified U result.

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Unit results

The minimum uniform marks required for each grade for each unit:

All units

Unit grade	A*	A	B	C	D	E	F	G
Maximum uniform mark = 80	72	64	56	48	40	32	24	16

Students who do not achieve the standard required for a grade G will receive a uniform mark in the range 0–15.

Qualification results

The minimum uniform marks required for each grade:

GCSEs in Biology Cash-in code: 2BI01

Qualification grade	A*	A	B	C	D	E	F	G
Maximum uniform mark = 320	288	256	224	192	160	128	96	64

Students who do not achieve the standard required for a grade G will receive a uniform mark in the range 0–63.

Resitting of units

Students can resit a unit once (regardless of tier) before claiming certification for the qualification. For internally assessed units students will need to retake the entire assessment requirements for that unit.

At least 40 per cent of the assessment must be taken in the examination series in which certification is requested and the results from these assessments must be used. Therefore, any previous, banked results for the unit(s) that are being used to satisfy the terminal requirement cannot be used even if they are better than the results achieved in the terminal series.

Results of units held in Edexcel's unit bank have a shelf-life limited only by the shelf-life of this qualification and, subject to the terminal requirement, these unit results may be re-used after certification.

Language of assessment

Assessment of this qualification will be available in English only. Assessment materials will be published in English only and all work submitted for examination and moderation must be produced in English.

Quality of written communication

Students will be assessed on their ability to:

- write legibly, with accurate use of spelling, grammar and punctuation, in order to make the meaning clear
- select and use a form and style of writing appropriate to purpose and to complex subject matter
- organise relevant information clearly and coherently, using specialist vocabulary when appropriate.

Stretch and challenge

Students can be stretched and challenged in units through the use of different assessment strategies, for example:

- using a variety of stems in questions – for example analyse, evaluate, discuss, compare, describe, explain
- ensuring connectivity between sections of questions
- a requirement for extended writing
- use of a wider range of question types to address different skills – for example open-ended questions, case studies, etc.

Malpractice and plagiarism

For up-to-date advice on malpractice and plagiarism, please refer to the Joint Council for Qualifications *Suspected Malpractice in Examinations*: *Policies and Procedures and Instructions for conducting coursework/portfolio* document on the JCQ website (www.jcq.org.uk).

Student recruitment

Edexcel's access policy concerning recruitment to our qualifications is that:

- they must be available to anyone who is capable of reaching the required standard
- they must be free from barriers that restrict access and progression
- equal opportunities exist for all students.

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Progression

- Students who successfully achieve this GCSE in Biology can progress onto a number of qualifications at Level 3, including a GCE in Biology.
- Students could also progress onto an Edexcel BTEC Level 3 Applied Science qualification.
- Students could also progress into employment.

Grade descriptions

Biology

A	Students recall, select and communicate precise knowledge and detailed understanding of biology. They demonstrate a comprehensive understanding of the nature of biology, its principles and applications and the relationship between biology and society. They understand the relationships between scientific advances, their ethical implications and the benefits and risks associated with them. They use scientific and technical knowledge, terminology and conventions appropriately and consistently, showing a detailed understanding of scale in terms of time, size and space. They apply appropriate skills, including mathematical, technical and observational skills, knowledge and understanding effectively in a wide range of practical and other contexts. They show a comprehensive understanding of the relationships between hypotheses, evidence, theories and explanations and make effective use of models, including mathematical models, to explain abstract ideas, phenomena, events and processes. They use a wide range of appropriate methods, sources of information and data consistently, applying relevant skills to address scientific questions, solve problems and test hypotheses. Students analyse, interpret and critically evaluate a broad range of quantitative and qualitative data and information. They evaluate information systematically to develop arguments and explanations taking account of the limitations of the available evidence. They make reasoned judgements consistently and draw detailed, evidence-based conclusions.
C	Students recall, select and communicate secure knowledge and understanding of biology. They demonstrate understanding of the nature of biology and its principles and applications and the relationship between biology and society. They understand that scientific advances may have ethical implications, benefits and risks. They use scientific and technical knowledge, terminology and conventions appropriately, showing understanding of scale in terms of time, size and space. They apply appropriate skills, including mathematical, technical and observational skills, knowledge and understanding in a range of practical and other contexts. They show understanding of the relationships between hypotheses, evidence, theories and explanations and use models, including mathematical models, to describe abstract ideas, phenomena, events and processes. They use a range of appropriate methods, sources of information and data, applying their skills to address scientific questions, solve problems and test hypotheses. Students analyse, interpret and evaluate a range of quantitative and qualitative data and information. They understand the limitations of evidence and use evidence and information to develop arguments with supporting explanations. They draw conclusions based on the available evidence.

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F	Students recall, select and communicate limited knowledge and understanding of biology. They recognise simple inter-relationships between biology and society. They show a limited understanding that scientific advances may have ethical implications, benefits and risks. They use limited scientific and technical knowledge, terminology and conventions, showing some understanding of scale in terms of time, size and space. They apply skills, including limited mathematical, technical and observational skills, knowledge and understanding, in practical and some other contexts. They recognise and use hypotheses, evidence and explanations and can explain straightforward models of phenomena, events and processes. They use a limited range of methods, sources of information and data to address straightforward scientific questions, problems and hypotheses. Students interpret and evaluate limited quantitative and qualitative data and information from a narrow range of sources. They can draw elementary conclusions having collected limited evidence.

C Resources, support and training

Edexcel resources

Edexcel aims to provide the most comprehensive support for our qualifications.

Edexcel publications

You can order further copies of the specification, Sample Assessment Materials (SAMs) and Teacher's Guide documents from:

Edexcel Publications
Adamsway
Mansfield
Nottinghamshire NG18 4FN

Telephone: 01623 467 467
Fax: 01623 450 481
Email: publications@linney.com
Website: www.edexcel.com

Endorsed resources

Edexcel also endorses some additional materials written to support this qualification. Any resources bearing the Edexcel logo have been through a quality assurance process to ensure complete and accurate support for the specification. For up-to-date information about endorsed resources, please visit www.edexcel.com/endorsed.

Please note that while resources are checked at the time of publication, materials may be withdrawn from circulation and website locations may change.

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Edexcel support services

Edexcel has a wide range of support services to help you implement this qualification successfully.

ResultsPlus – ResultsPlus is an application launched by Edexcel to help subject teachers, senior management teams and students by providing detailed analysis of examination performance. Reports that compare performance between subjects, classes, your centre and similar centres can be generated in just a few clicks. Skills maps that show performance according to the specification topic being tested are available for some subjects. For further information about which subjects will be analysed through ResultsPlus, and for information on how to access and use the service, please visit www.edexcel.com/resultsplus.

Ask the Expert – To make it easier for you to raise a query with us online, we have merged our **Ask Edexcel** and **Ask the Expert** services.

There is now one easy-to-use web query form that will allow you to ask any question about the delivery or teaching of Edexcel qualifications. You'll get a personal response, from one of our administrative or teaching experts, sent to the email address you provide.

We'll also be doing lots of work to improve the quantity and quality of information in our FAQ database, so you'll be able to find answers to many questions you might have by searching before you submit the question to us.

Examzone – The Examzone site is aimed at students sitting external examinations and gives information on revision, advice from examiners and guidance on results, including re-marking, resitting and progression opportunities. Further services for students – many of which will also be of interest to parents – will be available in the near future. Links to this site can be found on the main homepage at www.examzone.co.uk.

Training

A programme of professional development and training courses covering various aspects of the specification and examination will be arranged by Edexcel each year on a regional basis. Full details can be obtained from:

Training from Edexcel
Edexcel
One90 High Holborn
London WC1V 7BH

Telephone: 0844 576 0027
Email: trainingbookings@edexcel.com
Website: www.edexcel.com

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Appendix 1: Codes

Type of code	Use of code	Code number
National classification codes	Every qualification is assigned to a national classification code indicating the subject area to which it belongs. Centres should be aware that students who enter for more than one GCSE qualification with the same classification code will have only one grade (the highest) counted for the purpose of the school and college performance tables.	1010
National Qualifications Framework (NQF) codes	Each qualification title is allocated a National Qualifications Framework (NQF) code. The NQF code is known as a Qualification Number (QN). This is the code that features in the DfE Funding Schedule, Sections 96 and 97, and is to be used for all qualification funding purposes. The QN is the number that will appear on the student's final certification documentation.	The QN for the qualification in this publication is: GCSE in Biology – 600/0770/9
Unit codes	Each unit is assigned a unit code. This unit code is used as an entry code to indicate that a student wishes to take the assessment for that unit. Centres will need to use the entry codes only when entering students for their examination.	Unit B1 – 5BI1F/5BI1H Unit B2 – 5BI2F/5BI2H Unit B3 – 5BI3F/5BI3H Unit BCA – 5BI04
Cash-in codes	The cash-in code is used as an entry code to aggregate the student's unit scores to obtain the overall grade for the qualification. Centres will need to use the entry codes only when entering students for their qualification.	GCSE in Biology – 2BI01
Entry codes	The entry codes are used to: • enter a student for the assessment of a unit • aggregate the student's unit scores to obtain the overall grade for the qualification.	Please refer to the *Edexcel Information Manual*, available on the Edexcel website

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Appendix 2: How Science Works mapping

How Science Works reference *(see page 10)*	Unit B1 specification reference
1	1.2, 1.8, 1.14, 2.16, 2.22, 3.3, 3.15, 3.23
2	1.2, 1.12, 2.3, 2.17
3	1.7, 1.12, 1.23, 1.24, 1.26, 2.15, 3.17, 3.18, 3.22, 3.26, 3.27
4	1.2, 1.6, 1.7, 1.9
5	1.14, 2.15, 2.16, 2.22, 3.3, 3.15, 3.23
6	1.9, 1.14, 2.16, 2.22, 3.3, 3.15, 3.23
7	1.14, 2.16, 2.17, 2.22, 3.3, 3.15, 3.23
8	1.14, 2.16, 2.17, 2.22, 3.3, 3.15, 3.23
9	Throughout the unit
10	1.14, 1.24, 2.13, 2.22, 3.3, 3.15, 3.17, 3.18, 3.21, 3.23, 3.24, 3.26, 3.27
11	1.2, 1.7, 1.14, 1.24, 2.6, 2.13, 2.16, 2.17, 2.21, 2.22, 3.3, 3.9, 3.15, 3.19, 3.21, 3.22, 3.23, 3.24, 3.26, 3.27
12	1.8, 2.9, 2.11, 2.12, 2.18, 3.11, 3.12, 3.13, 3.14, 3.21
13	1.21, 2.18, 3.1, 3.4, 3.6, 3.7, 3.14, 3.26
14	1.2, 1.7, 1.8

How Science Works reference *(see page 10)*	Unit B2 specification reference
1	1.8, 1.10, 1.32, 2.5, 2.15, 2.20, 2.21, 2.22, 3.17
2	1.9, 2.21, 3.1, 3.3
3	1.9, 1.13, 1.16, 1.17, 1.23, 1.25, 1.27, 1.30, 1.31, 2.4, 2.6, 2.8, 2.12, 2.13, 2.16, 2.19, 3.11, 3.14, 3.15, 3.16, 3.17
4	1.10, 3.18
5	1.8, 1.32, 2.5, 2.15, 2.20, 2.21, 2.22, 3.17
6	1.8, 1.32, 2.5, 2.15, 2.20, 2.21, 2.22, 3.17
7	1.8, 1.32, 2.5, 2.15, 2.20, 2.21, 2.22, 3.17
8	1.8, 1.32, 2.5, 2.15, 2.20, 2.21, 2.22, 3.17
9	Throughout the unit
10	1.8, 1.28, 1.32, 2.5, 2.15, 2.20, 2.21, 2.22, 3.4, 3.5, 3.17
11	1.8, 1.9, 1.28, 1.32, 2.5, 2.6, 2.10, 2.11, 2.14, 2.15, 2.20, 2.21, 2.22, 3.17
12	1.5, 1.10, 1.12, 1.18, 1.19, 1.21, 3.1
13	1.10, 1.12, 1.19, 1.21, 3.18
14	1.5, 1.9

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How Science Works reference *(see page 10)*	Unit B3 specification reference
1	1.28, 2.8, 2.12, 2.14, 2.16, 3.4, 3.9, 3.11, 3.12
2	1.18, 1.19, 1.20, 1.23, 1.27, 1.30, 2.4, 2.6, 2.12, 2.14, 2.16, 2.17, 2.18
3	1.8, 1.13, 1.18, 1.19, 2.16, 2.17
4	2.16, 2.18
5	1.28, 2.8, 3.4, 3.9, 3.11, 3.12
6	1.28, 2.8, 2.16, 3.4, 3.9, 3.11, 3.12
7	1.28, 2.8, 3.4, 3.9, 3.11, 3.12
8	1.28, 2.8, 2.16, 3.4, 3.9, 3.11, 3.12
9	Throughout the unit
10	1.23, 1.26, 1.28, 2.8, 3.4, 3.9, 3.11, 3.12
11	1.18, 1.19, 1.23, 1.26, 1.28, 2.8, 2.16, 3.4, 3.9, 3.11, 3.12
12	1.4, 1.16, 1.22, 1.25, 1.29, 2.16, 3.5, 3.7, 3.10, 3.11, 3.12, 3.15, 3.16, 3.17, 3.18, 3.19
13	1.4, 1.16, 1.22, 2.16, 3.16, 3.17
14	1.20, 1.27, 2.12, 2.14, 2.15, 2.16

Appendix 3: Mathematical skills mapping

Mathematical skills reference *(see page 11)*	Unit specification reference		
	B1	B2	B3
1	3.17, 3.24	1.4, 1.5, 1.8, 2.3, 2.13, 2.23, 3.4	
2	3.24	1.5, 2.17, 2.23	
3	1.24, 2.13, 3.17, 3.24	1.5, 1.28, 2.5, 2.16, 2.23, 3.17	1.28, 2.8, 3.4, 3.9, 3.11, 3.12
4	2.13, 3.17	1.5	
5	2.13		
6	1.23	2.3, 2.23	3.3
7	1.14, 2.16, 3.3, 3.15, 3.23, 3.24	1.28, 1.32, 2.5, 2.16, 2.21, 2.23, 3.17	1.28, 2.8, 3.4, 3.9, 3.11, 3.12
8		1.28, 1.32, 2.5, 2.6, 2.16, 2.21, 2.23, 3.4, 3.17	1.28, 2.8, 3.4, 3.9, 3.11, 3.12
9	1.14, 2.16, 3.3, 3.15, 3.20, 3.23	1.28, 1.32, 2.5, 2.6, 2.16, 2.21, 2.23, 3.4, 3.17, 3.18	1.26, 1.28, 2.8, 2.18, 3.4, 3.9, 3.11, 3.12
10	3.24	2.5	
11	1.14, 2.16, 2.22, 3.3, 3.15, 3.20, 3.23	1.28, 1.32, 2.5, 2.6, 2.16, 2.21, 2.23, 3.4, 3.17, 3.18	1.26, 1.28, 2.8, 2.18, 3.3, 3.4, 3.9, 3.11, 3.12
12	1.14, 2.6, 2.7, 2.13, 2.16, 2.22, 3.3, 3.4, 3.6, 3.15, 3.20, 3.23, 3.24, 3.25	1.28, 1.32, 2.5, 2.6, 2.16, 2.21, 2.23, 3.4, 3.17, 3.18	1.10, 1.12, 1.23, 1.26, 1.28, 1.29, 1.30, 1.31, 1.32, 1.33, 2.8, 2.18, 3.3, 3.4, 3.9, 3.11, 3.12
13	1.24, 3.20	2.23	
14	3.15	2.23	
15	3.20		3.4
16		1.5	
17	2.13	2.5	
18		2.16, 2.23	
19		2.23	

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Appendix 4: The Periodic Table of the Elements

1	2											3	4	5	6	7	0
																	4 **He** helium 2
												11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
7 **Li** lithium 3	9 **Be** beryllium 4											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
23 **Na** sodium 11	24 **Mg** magnesium 12											70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	Elements with atomic numbers 112-116 have been reported but not fully authenicated					
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111							

Key

1
H
hydrogen
1

relative atomic mass
atomic symbol
name
atomic (proton) number

* The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.

The relevant atomic masses of copper and chlorine have not been rounded to the nearest whole number.

Appendix 5: Controlled Assessment Record Sheet

Centre Name:	Centre Number:
Teacher Name:	Qualification Number:
Qualification Title:	Examination Series:
Candidate Name:	Candidate Number:

One mark is required for each of the areas shown in Part A, Part B and Part C. The marks can either be for Part A, Part B and Part C from the same task or from different tasks relating to Units B2/B3 for this GCSE. Centres must retain all parts of the task for moderation.

Part A – Planning			**Part B – Observations**			**Part C – Conclusions**		
Marks from	**B2 / B3** delete as appropriate		**Marks from**	**B2 / B3** delete as appropriate		**Marks from**	**B2 / B3** delete as appropriate	
Area	**Centre mark awarded**	**Max. mark**	**Area**	**Centre mark awarded**	**Max. mark**	**Area**	**Centre mark awarded**	**Max. mark**
Equipment		**2**	**Primary evidence and recording**		**4**	**Processing evidence**		**4**
Controls		**6**	**Secondary evidence**		**2**	**Quality of evidence**		**4**
Hypothesis		**4**						
Risks		**4**				**Conclusions based on evidence**		**6**
Overall plan		**4**				**Evaluation of conclusion**		**4**
						Evaluation of method		**6**
Total		**20**	**Total**		**6**	**Total**		**24**
Total for Unit BCA: Biology controlled assessment								

Declaration of authentication

I declare that the work submitted for assessment is my own work and has been carried out without assistance, other than that which is acceptable under the scheme of assessment.

Candidate signature _____

Teacher signature _____

Date final record sheet signed _____

By signing the above declaration, you agree to your controlled assessment task(s) being used to support Professional Development, Online Support and Training of both Centre-Assessors and Edexcel Moderators. If you have any concerns regarding this, please contact Science2011@edexcel.com.

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Appendix 6: Certification, cash-in, transfer rules and entry code for transferring units

Certification and cash-in rules

Certification for the GCSE in Biology may be claimed in March, June or November, providing all of the contributing units have been entered and assessed and at least 40 per cent of the assessment has been taken in that examination series.

Students may also cash in for any of the other four science qualifications in the same examination series.

Externally assessed components

There is one unit code for any common external units.

The result of an external unit can only count towards one qualification. For example, if the result for 5BI1F (Unit 1 foundation tier) is used towards GCSE in Biology (2BI01), this same unit result cannot be used towards GCSE in Science (2SC01), or vice versa.

Transfer rules

If a student wishes to claim certification for GCSE in Biology **and** GCSE in Additional Science then the student must take the relevant external units for the two qualifications.

For the internal unit, a student's result from GCSE in Biology to GCSE in Additional Science and vice versa may be transferred providing the work submitted meets the requirements for the appropriate qualification.

A transfer can only be made once a centre can confirm this. If the requirement is not met for the second qualification then the student will need to do a new controlled assessment task.

Example 1: transferring the Biology internal unit result to Additional Science

If a student wishes to use the unit result from Unit BCA in the GCSE in Biology qualification (2BI01) towards Unit ASCA of the GCSE in Additional Science qualification (2SA01), then this is acceptable but only if the BCA unit result uses marks **only** from the B2 controlled assessment. If the BCA unit result uses any marks from B3, then the result **cannot** be transferred to GCSE in Additional Science, Unit ASCA.

Example 2: transferring an Additional Science unit result to Biology

If a student wishes to use the unit result from Unit ASCA in the GCSE in Additional Science qualification (2SA01) towards Unit BCA of the GCSE in Biology qualification (2BI01), then this is acceptable but only if the ASCA unit result uses marks **only** from the B2 controlled assessment. If the ASCA unit result uses any marks from C2 and/or P2, then the result **cannot** be transferred to GCSE in Biology, Unit BCA.

Transfer of a unit result

When a transfer is being requested for a unit result the following must be done by the Centre

- make the correct entry code
- provide evidence to Edexcel that the controlled assessment fulfils the requirements for the other qualification.

Evidence to support transfer of a unit result

Centres are advised to check before requesting a transfer that they have a copy of the record sheet of the original work. Although entries will be accepted for a transfer, if it is found that a centre has not provided a copy of the record sheet then the transfer request will **not** be granted.

If a centre requests the transfer of a controlled assessment unit result, the centre will need to provide a hardcopy or a scanned copy of the original record sheet to Edexcel to show that the work fulfils the rules for the second qualification.

The deadline for submission of this evidence is the same as the deadline for submission of controlled assessment work.

Please send a hardcopy of the record sheet to:

Edexcel
Lowton House
Lowton Way
Hellaby
Rotherham
South Yorkshire
S66 8SS

Or email a scanned copy to: Science2011@edexcel.com

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Entry codes for transferring units

The following entry codes should be used when transferring the unit results for the internal controlled assessed unit.

Entry code	When it should be used
5SA0T/01	When the unit result for a separate science is transferred towards a qualification in GCSE in Additional Science (2SA01)
5BI0T/01 5CH0T/01 5PH0T/01	When the unit result for 5SA04 is transferred towards a qualification in GCSE in Biology (2BI01), GCSE in Chemistry (2CH01) or GCSE in Physics (2PH01)

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